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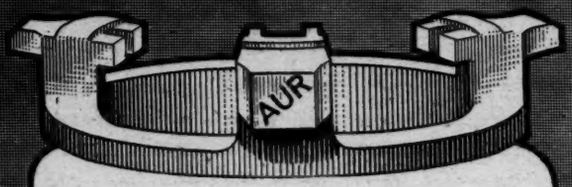

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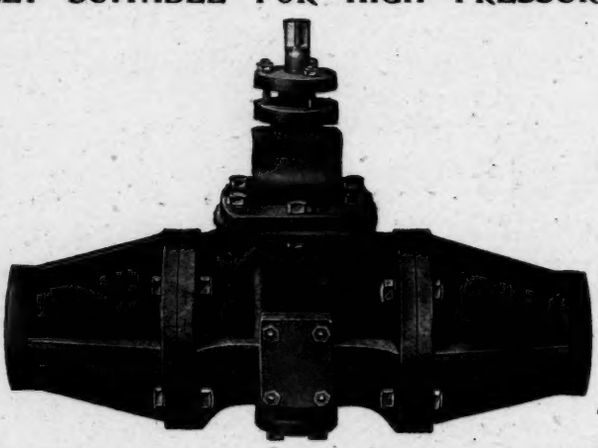

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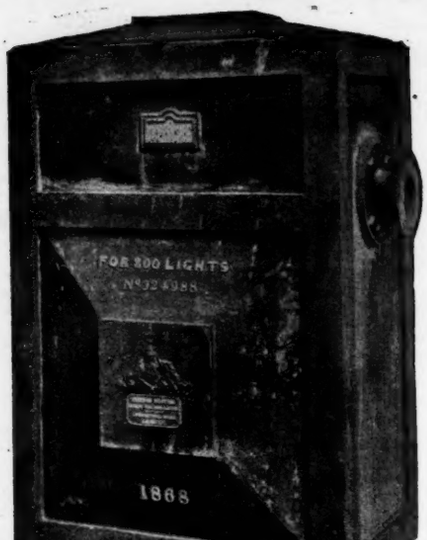

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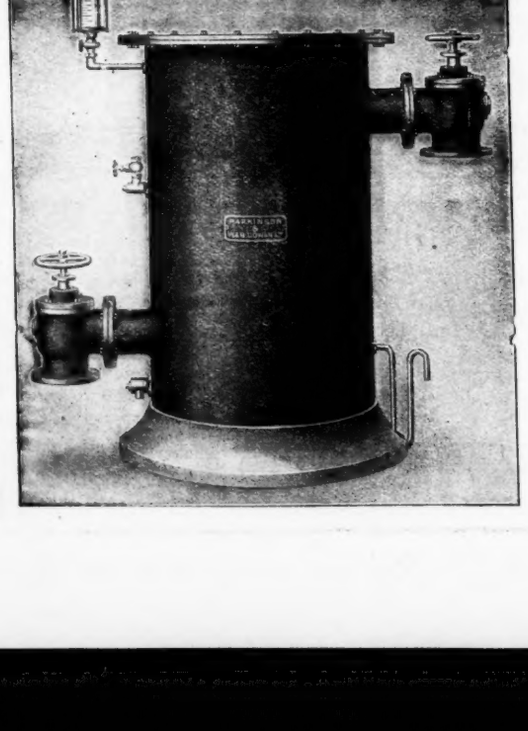

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLIV., No. 2893.] TUESDAY, OCTOBER 22. 1918. [70TH YEAR.

EDITORIAL NOTES.

The Institution and the Reconstitution of the National Gas Council.

THE Institution of Gas Engineers held a special general meeting last week of a remarkably notable character. We are living in times when the industry is called to do a vast amount of constructive work if it is going to make the advancement of its interests which its potentialities grant to it. All the subjects that engaged the attention of the members last week had a bearing on the constructive side; and, on every hand, there was agreement that the calling of the meeting to consider and discuss the matters upon the agenda was amply justified. For it there is little question that the members—and assuredly the industry as well—are indebted to the enthusiasm of the President (Mr. Samuel Glover). It was noticed that in one place he referred to the meeting as the "half-yearly" one. It is hoped that, at any rate during the years of rehabilitating and pressing creative work, this description will be realized, because, as the technical discussions again demonstrated on this occasion, good results emerge from the conference of many skilled brains. At all events, the Gas Investigation Committee and the Gas-Meters Research Committee will find the comment and criticism useful to them; while, by their reports and by that of the Refractory Materials Committee, the members have had their interest stirred in new directions. We look back upon the meeting with infinite pleasure; and so does every gas man whose good fortune it was to be present.

But there was one matter—it was the first to engage attention—in connection with which we fear the members made a slip. It refers to the reconstitution of the National Gas Council (to the Executive Board of which the Institution are invited to send four members) with the view to giving it a broader representative basis, so that the whole of the gas undertakings of the country may have direct representation and voice, as well as part in decisions. This reformation of the Council is a matter of an importance to the industry that one cannot over-estimate. It is as patent as anything can be that, if the gas undertakings of the country combine "according to plan," the industry will have a power in its hands of indescribable worth to it; and this accumulation of power, we feel sanguine, will ultimately give to the industry that completeness of organization that so many desire, in order that it may use its maximum influence in every direction. Listening to the discussion at the meeting, there seemed to be a great lack of general appreciation of the importance of what is in view from the industry's side as distinct from the professional side, though the latter has everything to gain by the influence that the industry possesses being marshalled for all good operative purposes. Those who had been in closer contact with the movement for reconstitution—the President, the Hon. Secretary (Mr. W. E. Price), and members of the Council—of course fully appreciated all this; and there was no excuse for the members not doing so, in view of the sketch of the scheme which appeared recently in our columns. What the members appeared most concerned about was the question of their numerical representation on the Council, which is a matter of comparatively small moment compared with the objects which the reconstitution scheme is directed to achieve, in which connection Lord Moulton's speech at a luncheon given by Sir Hallewell Rogers, the retiring President of the British Commercial Gas Association on Wednesday, affords excellent reading.

There is what we have designated a "slip" on the part of the members. It is our hope that the description is wrong. If proved to be so, we shall be pleased to acknowledge it. The resolution put before the meeting was to the effect that the members approve in principle of the reconstitution scheme; and to this, following an appeal by Mr. Charles Carpenter, D.Sc., there was added (the words were suggested by him) "provided a separate organization is "formed to deal with labour matters." Now, in the first place, the resolution only approves in "principle" of the scheme; and therefore the Council of the Institution have no final authority from the members to definitely commit the Institution. But still worse comes when consideration is given to the effect of the addendum. What does it mean? That the members of the Institution have only approved in principle of the scheme of reconstitution, conditionally on a separate organization being formed for dealing with labour matters. Therefore, unless the National Gas Council completely dissociates itself from any body established in the gas industry to deal with labour matters, the members of the Institution do not approve of the scheme in principle. This is our reading of the resolution. The Institution Council may construe it otherwise. The reconstitution scheme provides for the establishing of an Employers' Committee, membership of which is to be optional, and the undertakings that are members of the National Gas Council need not be associated in any way with the Committee. The Council of the Institution consider that the Committee is a separate organization. So it is to all intents and purposes. But do the Council seriously think that, if this was the opinion of Mr. Carpenter, he would have gone to the trouble to propose the proviso? The negative answer is the only one. His addendum must be interpreted by reference to his speech, which described what has been done in the chemical industry. A Chemical Manufacturers' Association was recently formed, and, completely detached from it, a Federation of Employers for dealing with labour matters. Between the two there is no coupling in any shape or form. The one is completely independent of the other. That is what the proposer of the proviso which the members accepted calls a "separate" organization, and nothing short of it. If this is the position, the Institution Council will have to extricate themselves from it in some way. But it will not be by misinterpreting the intentions of Mr. Carpenter. The resolution has been passed, and so long as it stands, the Council are in honour bound to abide by it. This is only pointed out in order to avoid future complication.

At the same time, we are quite of the opinion that the Employers' Committee—membership of which is optional, and for the doings of which the National Gas Council would not be responsible—will be as good as, if not better than, an organization separated body and limb from the central organization of the industry. Matters may probably arise in regard to which conference with the representatives of the gas undertakings of the entire country may be advisable. We may as well be plain. Under the new order of things, an organization to deal with labour matters is essential. The Government is moving to bring employers and trade unions into a position for joint conference and action—not individual employers, but the employers representing entire industries. What does this mean? It means that it will not matter a jot whether the organization dealing with labour questions is coupled-up to the Council or is an organization distinct in every sense of the word—its decisions will be felt throughout the whole industry, excepting perhaps where employers and employees are working in co-partnership, and settle matters themselves. We are no believers in interference in any shape or form where justice reigns as between

employers and employed. But no intelligent man can have failed to observe changes already here and in the making; and, with these changes, is it better for an industry to have for dealing with labour matters a body with a link with the central organization or without? We fail to see that such a link can do any harm; and we have not seen any specific reasons put forward to show it will, or is likely to, do so.

Investigation into the Use of Various Grades and Compositions of Gas.

We must confess to somewhat mixed feelings over the first report of the Gas Investigation Committee, which was submitted at the meeting of the Institution last week. It is in some respects a valuable report; but the value would have been greatly enhanced if the investigators had left no room for criticism of methods. The report may be regarded in two lights. It has projected opinion a good distance along the road to the production of a lower calorific quality of combustible gas, subject to manufacturing economy; while, on the other hand, the results of tests made by consuming different grades and compositions of gas are not, in respect of lighting and gas-fire heating efficiencies, reputable from the gas industry's point of view, through the inferior character of the appliances used in the tests. The investigators took considerable pains to have their measuring instruments beyond reproach before commencing the inquiry; but at the other end, an upright incandescent burner was used in the lighting tests instead of an inverted one, and in part of the gas-fire tests a fire was employed which could not be properly regulated for the different gases, and the radiants of which were admittedly unsuitable. In view of the publication of the report and the figures, we must, though regretting the necessity, make prominent mention of this in the interests of the gas industry. It has in defence been pointed out that no one, in view of the preliminary character of the report and the acknowledgment in it of the defects, can honestly make use of the figures. We fully concur. But, whether honestly or not, use may be made of them to the disadvantage of gas, with upon them the imprimatur of the Gas Investigation Committee.

The Legislature has recognized as a fundamental right that gas should be allowed in its testing to have those appliances which will develop its maximum efficiency. This is quite an ancient recognition; and the industry had it confirmed in the Carpenter burner and in the total-heat calorimeter. The same principle that is recognized by the Legisture should be followed in testing the uses of gas in present-day appliances. One cannot expect to correctly gauge the efficiency of any gas if the appliances in which it is used are not themselves efficient. It is not the indifferent ones that should be regarded as representative of the consumers' appliances, but those which incorporate in them the maximum progress in invention, and which are the standard towards and from which (in the upward direction) the gas industry is working. The Committee have to investigate gas composition in relation to use; but the gas composition refers to the future, not to the past. It is therefore the duty of the Committee to prosecute their reference with due heed to the character of the gas appliances by means of which the gas is to be consumed. The users of good gas-fires and other heaters do not want the gas supplied to them to be curtailed in any manner through any criterion set by inferior gas-using appliances, any more than users of inverted burners desire the gas supplied to them to be the gas that the users of flat-flame burners would prefer, and which is uneconomical in different senses for both. Moreover, upright burners can be discarded for inverted ones; and it is not beyond the power of manufacturers to supplant gas-fire burners that are inefficient through want of provision for adequate regulation by burners that are efficient in this respect, and to do the same with the radiants. There must not be any subordination whatever of manufacturing economies to defective gas-using appliances. The only limits must be those set by determining the character of the gas which will be the best not for one use, but for the diverse uses. We are sorry that there has been an opening for criticism in this way; and it could have been avoided by doing before what the Committee are now going to do—use inverted burners and gas-fires that accord with present-day production. It is with these appliances that investigation ought to have commenced. But, on the other hand, while the results are low, for the upright burner, and the gas-fires (taking radiant efficiency alone, without reference to convection and conduction), they do show that even under unfavourable combustion conditions, the results with the gases tested were of a character which indicate that, giving them the more favourable conditions of present-day gas-using productions, highly gratifying results will be achieved with gas that can be economically produced.

We will not here refer specifically to the results of the tests. These are sufficiently presented, prior to our publication of the text of the report, in the "Review of the Pro-" ceedings" published in subsequent columns. The reference to the Committee is for the purpose of ascertaining how far different grades and compositions of gas are economical to the consumers; and a subsequent part of the exploration is to be devoted to the question of economical gas production—the two sides really forming one question. It is in connection with the range taken by the investigation into different grades and compositions of gas that praise can be unstintingly given on the ground of thoroughness; and it is this part which is the most enlightening within the limits allowed by the appliances used in making the tests. Plain coal gas, mixtures containing carburetted water gas or blue water gas, or air mixed with the gas in the holder, as well as Mond gas with a slight addition of coal gas, were all investigated with boiling-ring, upright burner, and gas-fire. Some practical experience in the supply of low calorific power gas was also given during the discussion. The gases investigated were of high and low calorific values, and the quantity of inerts varied considerably. The results showed that for boiling purposes composition and inerts have very little, if any, effect on efficiencies based on thermal value. Some 50 p.ct. efficiency is about the rule whatever the character of the gas, provided the distance between the base of the heating utensil and the surface of the burner is correct—a fair distance being 1 in. The addition of air to the gas in the holder is shown to have no advantage; and it is better to allow a properly adjusted gas-burner to take-up its own quantity of air according to its requirements under the conditions of composition and pressure. Speaking of gas engines—which is a line of research still to be taken up by the Committee—Sir Dugald Clerk (who by the way is satisfied that boiling-burners could be made to give 20 to 25 p.ct. better efficiencies than shown in the report for ring burners), made the point that, as a consumer, he only wanted to pay for B.Th.U., and not for avoidable inert constituents of which he could get all he required, and as he wanted them, from the atmosphere. His idea of the gas of the future is one having somewhere in the neighbourhood of a calorific value of 420 B.Th.U.

The experiments with gas-fires so far as they have gone, show a capacity for dealing with a wide range of gases, given the power of adjustment and suitable radiants. The manufacturers should devote themselves assiduously to provide for coming events. But the upright incandescent burner is the most sensitive to changes in composition, as shown by illuminating power efficiency based on the thermal value of the gas, which is a new mode of expressing lighting efficiency. The mantle depends upon flame temperature, and the most active part of the flame is its surface. The flame must fit the mantle; and when one gets to some of the grades of gas mixtures with their reduced flames, although of great intensity, it is found impossible to fill the upright mantle. This is just where the smaller mantle of the inverted burner will show to great advantage. It is unquestionably going to be a good auxiliary in the determination of the gas of the future. In the investigation with the upright burner, it was found that a gas of low calorific value and high inerts was distinctly inferior to a gas of similarly low calorific value and low inerts. But the investigators of these lighting tests incline to view as quite acceptable a gas of 525 B.Th.U. But this, of course, is subject to the tests with the smaller mantle of the inverted burner, when we think it will probably be found (gathering together all economical considerations) that gas of lower calorific value will be more advisable. We have to strike the correct quality point for gas between economical production and the diversity of uses. A matter not dealt with is that a good combustible gas of lower calorific power than the present standard would require less air per cubic foot to effect its combustion than a higher grade gas; and therefore, if a higher efficiency can be obtained through both gas and appliance suitability, the volume of the heated products would be smaller. Evidence was offered during the discussion of lower calorific value gas than was formerly supplied doing the work of the consumers without at all affecting the

volume of their demand; and this appears to indicate that the appliances they use were not realizing the best service from the gas formerly supplied. This is not the first time that there has been very similar evidence based on practical experience.

Tests and experience both show that light is penetrating the nebulous cloak with which custom and legislative restriction have garbed this question; and it should not be long before the gas industry is of single mind that its own interests, the interests of consumers, and those of the nation demand of it to get into its distributing systems as many B.Th.U. per ton of coal as the various considerations pronounce to be practicable.

Causes of Increases in Unaccounted-for Gas and Meter Deterioration.

THE stage of investigation has now been reached when it can be said, with a fair amount of confidence, that a considerable proportion of the latter-day increase in unaccounted-for gas and the accretion of meter troubles are due to the effects upon meters of current gas-manufacturing practice. Therefore, the difficulties in these two respects must be accepted as being entirely home-produced, and cannot be attributed to any depreciation in the work of meter manufacturers. The chemical research of Mr. J. G. Taplay and the detective investigation into the question of unaccounted-for gas made by Mr. B. R. Parkinson in the district of the Gas Light and Coke Company, have thrown a considerable amount of light on what had almost assumed the form of a double mystery; and what is more it has presented a practical, readily applied remedy, which is also of great importance, in view of the fact that the abstraction of benzol from gas is something that is likely to stay as part of the processes of many gas undertakings. We compliment both these investigators on the success of their inquiry; and the Gas-Meter Research Committee of the Institution on having secured from them contributions which will be of supreme value to the whole gas industry. Conspicuous ability in investigating cause, effect, and remedy is shown.

It must be admitted that, in respect of unaccounted-for gas, the district of the Gas Light and Coke Company is peculiar in the nature of the protection received by the distribution system. But, when one has regard for the general character of the complaints that have been made as to increases of unaccounted-for gas and of an accretion of meter troubles, then one may assume that the causes have fairly common origin. To have proper sequence, the investigations of Mr. Parkinson should take precedence, with equality in importance to Mr. Taplay's chemical research, conclusions, and suggestion. There cannot be much doubt now that the increases in unaccounted-for gas and meter troubles are due to the same causes, and that the main, if not the entire, explanation of the former may be looked for in the latter. The increases are probably due to three causes—the reduction in use of carburetted water gas, the removal of benzol and other hydrocarbons from the gas, and the destructive tendency of moist sulphur dioxide which is always present in blue water gas. This group of contributors to the troubles so widely experienced show that, unless a simple remedy can be devised, the enforced changes in present-day practice have, and will continue to have, their economy discounted by the effects upon consumers' meters. But every change begets some new obligation; and this is an obligation which must be met in order to bring into account improved economic conditions. Mr. Parkinson, after much patient inquiry, found that there is in the district of the Gas Light and Coke Company a remarkable symmetry between curves showing unaccounted-for gas on the one hand and the use of carburetted water gas on the other, and that the behaviour of meters has grown worse with the reduction in the use of oil—this being due to the protection which the oil gives to the meters. Material proof that oil in the gas is a meter protective is afforded by the very different experience in the area supplied from the Kensal Green works of the Company, the gas from which station is treated to a paraffin fog by the Botley process, and the interiors of the meters in the area are found to be well oiled with paraffin. Therefore the oil mist renders a service other than that of supplying solvents for the naphthalene; and we should think it preferable over the carburetted water gas so far as the meters are concerned.

From this evidence, we turn to Mr. Taplay's researches; and it is seen that he has unveiled the substances in the bodies condensed in dry meters which (the review of the paper in this issue designates them) attack tinned sheet-iron and brass; the corrosion of the latter being very rapid. Then it is also seen that ammonia, while not acting on the metals, aids and abets the destructive work by removing the oil dressing and the tannin from the leather—thus causing the leather to shrink and to harden. Aqueous solutions of various compounds (also named in the review) similarly abstract the oil dressing from the leather; and certain of these solutions (after the removal of the oil dressing) were found to contain leather substances. There is also the sulphur dioxide in the blue water gas, which compound is produced by the oxidation of the sulphur content of the coke; and it is most damaging to the metal parts and to leather. The use of a little oil for carburetting purposes, or the passing of a small amount of ammonia with the blue water gas into the purifiers, will eliminate the sulphur dioxide. The corrosive bodies are partly produced by the reaction of carbon bisulphide with ammonia; and the removal of benzol from the gas has unfortunately energized these two bodies. To prevent this, compensation has to be made. In fact, the whole of the evidence points to the reduction of the hydrocarbons in the gas being the cause of the destructive influences on meters, and the increase of the unaccounted-for gas; and therefore the remedy is to compensate the meters for the protecting substances of which they have been robbed—the benzol and other bodies removed from the gas sent out into the district.

Mr. Taplay's remedial suggestion is that new and repaired meters should have their mechanisms sprayed with solar distillate. Mr. Parkinson would go farther, and save the destructive action upon meters by treating them very generally. He would fit a motor van with the equipment for spraying, pay house-to-house visits, and oil-spray the meter mechanisms on the spot. The work so far done has been effective. But there is one thing that must be guarded against, and that is the use of unsuitable oil. It would never do, for example, to use water-gas tar oil, because it contains a large quantity of resin-like substance; and much valve stoppage has lately been experienced in meters through a gummy compound of the nature of resin, produced by the oxidation of a constituent of the tarry and oily condensates from the gas.

Both Mr. Taplay and Mr. Parkinson have done extremely good work for the industry through their investigations; and in making this acknowledgment, the indebtedness of the industry to the Gas Light and Coke Company should not be overlooked, for the investigation was instituted originally for their own information. The result is given freely to the gas industry.

Corrosive Action of Flue Dust on Refractories.

The Refractory Materials Committee presented a report, at last week's meeting of the Institution of Gas Engineers, on the subject of the "Corrosive Action of Flue Dust on Fire-Bricks." The same report (which was prepared by Dr. J. W. Mellor) was also presented at the meeting of the Ceramic Society. The report indicates that the Committee have now (after disappointments through the war) got their equipment for these further researches forward sufficiently to take seriously in hand the fresh work. As one of a series, the report will early have a companion treating of the abrasive action of dusts. Pending the publication of the full report in our columns, some of its salient features are given in the "Review of the Proceedings" at the Institution meeting, at which Mr. J. P. Leather summarized the document in a manner which made abundantly clear the line of the research and the results.

Society of British Gas Industries and the N. G. C. Reconstitution.

It is not surprising to learn that the members of the Society of British Gas Industries should feel somewhat incensed to find that the promoters of the reconstitution of the National Gas Council have no place for their representation in the new body, other than through membership of the British Commercial Gas Association, or by co-opting members on Committees for special work, or by electing distinguished members in their ranks as honorary members. The members naturally think that some indignity has been thrust upon them. We have always maintained, and do so now, that the manufacturers of gas plant and gas-consuming appliances (to whom the industry are greatly indebted) are as much an integral part of the gas industry as are the under-

takings that use the gas-making plant, and can only sell their gas through the appliances made for the purpose. At this stage, however, there is something to be said on both sides in connection with the reconstitution of the National Gas Council. The present proposal is an attempt to secure unity in, and complete representation of, the gas-supply industry; and there are still gas administrators who hold the opinion that the political interests of the gas-supply industry are not in any way identical with the interests of members of the Society. There is not the slightest personal feeling in the matter; but they adhere to the opinion that the dissimilarity of objects, except in special directions, does not admit of any true cohesion. We are particularly sorry, because for years we have in these columns advocated complete organization. It was our original advocacy that gave birth to the Society of British Gas Industries; and—not for that reason, but on higher grounds—we shall not, when later the question of the consolidation of the organizations of the industry is taken in hand, be content with any scheme that does not include the Society, which has shown a whole-hearted concern in advancing the general interests of the industry. The resolution passed at the meeting of the Society last week approves of the National Gas Council undergoing reorganization. But it is understood that this representation has in no wise altered the position. With regard to the second part of the resolution—"It is only on these conditions the Society can consent to support the reconstituted body"—it may be pointed out that naturally, for the work of a body upon which the Society is not represented, no financial support could be expected, and, in fact, is not sought. But a word of advice to the members of the Society, "Do not, through umbrage over this matter, evacuate any other of the territory already occupied. It will be an advantage to be there when the question of a larger scheme is taken in hand."

A Good War Record for Birmingham.

Lord Moulton, the new President of the British Commercial Gas Association, must have smiled grimly as he heard his predecessor (Sir Hallewell Rogers), at the meeting of the Association last week, relate what the Birmingham Gas Department had been doing in the war. It would be too much to take Birmingham as the standard of all gas undertakings in this matter; but if it could be, the old Senior Wrangler would not have much difficulty in making an exact computation of the direct part the industry has taken in the war through its operations, to say nothing of men. But he knows that every gas undertaking has done its part according to its opportunities. It has not been the good fortune of all to help to win the war by supplying 14,000 million cubic feet of gas solely for the manufacture of munitions. Birmingham has done it. It has not been the lot of all to have supplied sufficient explosive material to fill 25 million 18-pounder high explosive shells. Birmingham has done it. But it may be confidently said that every gas undertaking has done its part. Lord Moulton knows this; and he has pretty freely acknowledged it by word of mouth, by action, and by his personal interest and devotion of well-filled days to the work of the industry.

Gas-Firing of Boilers.

The Bonecourt system of (among other applications) firing gas-boilers has created a good deal of interest in the gas industry; and as we progress towards that ambition of progressive gas men, to produce and sell a gas altogether suitable for heating and witha cheap, the prospect will increase of boilers that are not fired by coke being fired by gas, and so interest in the subject of the firing of boilers will be cumulatively intensified. Gas is an ideal boiler fuel; for it is easily applied and regulated. Capital costs, too, are smaller than with coal-fired boilers. Industrially produced gas has drawbacks which reduce efficiency; while gas of the coke-oven variety shows a splendid efficiency. So that, if gas cost did not come into the calculation, town gas compared with (say) blast-furnace gas could win "hands down." Economical supply where industrially produced gas is not available is a point for the gas industry. We have before suggested that in a concentrated manufacturing area, producer gas made from coke might be distributed for industrial heating and power. It would also find favour for boiler-firing.

Mr. Hunter's Studies.

In a paper read before the South Wales Institute of Engineers, Mr. T. M. Hunter (who has largely studied this subject) shows that the ordinary efficiency of gas-fired boilers under present conditions is only 50 to 60 p.ct.; and on blast-furnace gas work there are many giving as low as 30 p.ct. But when it is seen that with coke-oven gas 83 p.ct. efficiency can be obtained for a water-tube boiler, with superheater, but without economizer; 80 p.ct. for a Lancashire type boiler, with superheater and economizer, fired with cleaned blast-furnace gas; and 79 p.ct. for a Lancashire boiler, with both superheater and economizer, fired by producer gas—it is at once clear that proper application will realize excellent efficiency. Mr. Hunter, in his paper, tells of the evil results on efficiency of dust in the gas, of the depreciating power of water vapour in the gas on the efficiency of combustion, and therefore on flame temperature (owing to the amount of heat carried up the chimney in the waste gases), and of the losses due to admission to the boiler of air in excess of the minimum required for the combustion of the gas. The gas should be burned immediately and completely at the highest flame temperature, and with the smallest excess of air. Preheating the air is important; and intimate mixture of the gas and air is best obtained when gas or air, or both, are under pressure. From his experience in boiler-firing with Mond gas, Mr. Hunter shows that gas-firing need not be responsible for damage to boiler-tubes. If gas is burned with a small excess of air, so that there is a minimum of oxygen in the burnt gas, and if combustion takes place quickly, so that it is practically complete before the gases touch the boiler-tubes, no damage whatever can happen to them. It is clear that carelessness of application is responsible for low efficiency in gas-fired boilers.

PERSONAL.

Lieutenant FRED. D. HINCHCLIFFE, R.F.A., who has been awarded the Military Cross, was, prior to joining the forces, Secretary and Manager of the Haltwhistle Gas-Works.

Alderman GEORGE GUMMER, J.P., the Chairman of the Rotherham Corporation Gas Committee, and for over thirty years one of the most active members of the Town Council, who was Mayor of the borough in the years 1899 and 1900, will again be nominated for the office next month.

The Padiham Urban District Council have decided to appoint Mr. A. F. AMES, Gas Manager at Silsden, to the vacant position of Manager of their gas-works, at a salary of £300 a year. There were originally forty applicants. Mr. Ames was trained under Mr. J. H. Davies, at Oswaldtwistle, and has been at Silsden for two years.

The King has been pleased to give authority to certain officials of the Ministry of Munitions to wear decorations which have been conferred upon them by the King of the Belgians "in recognition of services rendered." Among others named are the Right Hon. Lord Moulton, G.B.E., K.C.B., who is made Commander of the Order of Leopold, and Mr. Achille Bazire (Lord Moulton's Private Secretary), who is designated as a Chevalier of the Order of the Crown.

Temporary Captain W. BOUVARD M'LUSKY, son of Mr. W. B. M'Lusky, the Halifax Corporation Gas Engineer, and brother to Mr. J. M'Lusky, President-elect of the Yorkshire Junior Gas Association, has been awarded the Military Cross. Captain M'Lusky joined the Halifax Volunteers on the outbreak of war, and enlisted in the Gordon Highlanders in June, 1915. In August, 1916, he was given a Commission, and has since been promoted on the field. He is not yet 21 years of age.

OBITUARY.

Mr. W. T. BUCKLAND, the Engineer to the Chesterfield Gas and Water Board, has had the misfortune to lose his wife, after a distressing illness. The funeral took place last Saturday week.

We regret to learn that Mr. JOHN FOSTER, the Engineer of the Windsor Street gas-works of the Birmingham Corporation, has recently lost his wife, who died at Erdington in the early part of last month.

Mr. BURTON CORDINGLEY, the Chemist to the Yorkshire Coking Company, Glass Houghton, died last week from pneumonia, following influenza. He was at one time assistant to the late Mr. Stanley Cooper, B.Sc.

Among the victims of the German submarine outrage in the sinking of the Royal Mail steamer "Leinster" between Kingstown and Holyhead was Mr. JONATHAN MAGRATH, the Engineer of the Cork Gas-Works. The remains were recovered and conveyed to Cork for interment. The funeral was very large and representative of all classes of the citizens. Wreaths were sent by the Directors of the Gas Company and the various staffs. Mr. Magrath was exceedingly popular in Cork, and hosts of friends have paid tribute to his work and worth; while the deepest sympathy has been extended to his widow and relatives.

NATIONAL GAS COUNCIL.

The Reconstitution Scheme.

A Meeting of the Council was held at the Caxton Hall last Thursday, for discussion of the Draft Constitution and Rules proposed for the basis of the enlargement of the Council on representative lines.

A long discussion took place; and a number of amendments were agreed upon. The Constitution and Rules were then referred back to the Drafting Committee, who will again report to the Council in due course.

Executive Committee's Meeting.

A Meeting of the Executive Committee of the National Gas Council was held on Tuesday last.

The future financial position of the gas industry was discussed by the Committee, and it was decided to collect further statistics, so that a case may be submitted to the consideration of the Government.

A minute of the General Consultative Committee, requesting the Executive Committee to make representations to the Controller of Coal Mines regarding the serious shortage of coal stocks of gas undertakings, and the diversion of gas coal to outside industries, was reported. It was decided to write and ask Sir Guy Calthrop whether he could give the industry some assurance that gas undertakings will receive preferential consideration in the matter of coal stocks and of deliveries throughout the coming winter; and to point out to the Controller once again the serious results which would attend any failure of gas supply.

Consideration was given to the provisions of the Gas Coke Prices Order, 1918. Alderman F. S. Phillips (Salford) stated that a deputation of Lancashire gas representatives proposed waiting upon the Controller of Coal Mines to discuss the extremely unsatisfactory terms of the Order. It was arranged that representatives of the Council should accompany the deputation; that a strong protest should be forwarded to the Controller against the serious financial burden on gas undertakings involved in the operation of the Order; and that a request be put forward that the Order should be withdrawn.

It was reported that the Council had taken up with certain contractors for the purchase of ammoniacal liquor and of crude and concentrated ammonia the question of increasing the prices for such commodities, in view of the enormous increase in the manufacturing costs of gas undertakings which have taken place since the price of sulphate of ammonia was fixed by the Government, and also in view of the payments-in-aid received by such contractors from the Government.

Application having been made by the Council to the Ministry of Munitions for a revision of the prices now being received by gas undertakings for retort carbon, it was reported that the Ministry had seen fit to authorize an increase of 20 p.ct. as from the 7th inst.—the increase to be calculated on the last contract entered into with Mr. Dasnieres (the contractor licensed by the Government) by any undertaking.

An application from the Federation of British Industries for statistics of the rise in gas-workers' wages during the war was considered; and it was decided to forward to the Federation details of the award made by the Committee on Production on the 27th of March last, and of the recent national settlement with the unions by negotiation.

Further cases of preferential treatment of electrical undertakings were reported. It was decided to take further action in these and kindred matters.

Proceedings at a meeting of the Imperial Commercial Association, held on the 2nd inst., to protest against the continuance and extension after the war of State restriction and trade by licence were reported. A communication from the Federation of British Industries bearing on the same subject was also submitted.

Resolutions received from various District Gas Associations and Institutions were submitted in connection with the appointment of a Sub-Committee to investigate the position of the gas industry; the extension of the scope of the Executive Committee, in order to provide for greater representation of Provincial gas undertakings; and the necessity for the gas industry being represented by a separate advisory department of the Ministry of Munitions, which should deal with all matters affecting the gas industry, and should have powers similar to those of the Electricity Department of the Ministry. It was reported that these matters were already receiving the attention of the Committee.

A letter was submitted from the Scottish Gas Council, with reference to the low prices being offered at the present time for spent oxide from gas-works, compared with prices ruling a few months ago. It was suggested that the District Gas Institutions and Gas Associations throughout the country be asked to collect statistics in this connection from the gas undertakings in their respective districts, and forward them to the Council, or, in the case of the Scottish undertakings, to the Scottish Gas Council. The matter would then be taken up with the Ministry of Munitions.

The progress to date of the investigations regarding the sale of tar by gas undertakings to distillers was discussed; and it was decided that, before details of the draft scheme were submitted to the Committee appointed by the Council and to the Council itself, it was desirable to sound the industry as to the view taken of the scheme as propounded by the Sub-Committee of representatives of producers and distillers.

It was reported that, under an amending Order [now out of print], purchases of linseed and linseed oil without a licence had been reduced from five tons to five cwt. per month; also that the United Kingdom Linseed Oil Consumers' Association had reduced their membership subscription from two guineas to half-a-guinea. It was also pointed out that there appears to be no reason why gas undertakings should not obtain their supplies of linseed oil, &c., through their usual dealers.

Manchester and the Gas Coke Prices Order.

In connection with the action of Lancashire gas undertakings referred to above, it may be mentioned that Mr. Fredk. A. Price (the Superintendent of the Manchester Corporation) wrote on the 10th inst. to Sir Guy Calthrop (the Coal Controller) pointing out that difficulties had arisen in the interpretation of the Order, and asking him to receive a deputation; but after further correspondence, a telegram was received from the Coal Mines Department intimating that it was not convenient to receive the deputation on the day proposed.

Meanwhile, Mr. Price had addressed a letter to the engineers and managers of the larger undertakings in Lancashire and Cheshire stating that steps had been taken in the matter of a deputation, in view of the fact that, so far as the effect of the Order "is apparent, there will be most serious consequences to the gas industry." At the same time, they were asked to attend a private preliminary meeting, which was duly held, and presided over by Alderman Kay (the Chairman of the Manchester Corporation Gas Committee). Some fifty representatives of gas undertakings were present; and the suggested deputation was approved of.

It is the unanimous feeling locally that, if the Order is to be redrafted and expressed in clearer language, the deputation should be received before its form is finally decided upon.

ELECTRICITY SUPPLY MEMORANDA.

A Belling Rationing Order.

THE Belling electric-fire people are trying to push their wares in a manner which is not particularly clever nor (from our way of thinking) altogether creditable, because those who know will find it easy enough to appreciate and to show that their claims are extravagant, and therefore misleading. They have issued some literature in connection with fuel rationing, and one of the circulars has every appearance of being a relative of the official form F.H.F1, and what is more it is headed "Household Fuel Rationing Order" (October, 1918). The circular advises householders to carefully study how to get the maximum warmth and comfort from the amount of fuel allowed under the Order; and the householder student does not go far before he finds that the author of the circular has an ardent desire to impress him with the idea that maximum warmth and comfort can be obtained through "the medium of the Belling electric-fires." This is a matter which must be decided by fact, and not by postulation; and it is to be hoped that the householder student of the precious circular will see to it that it is fact and not postulation that he has got hold of after he has thoroughly absorbed its contents. Let him remember, too, that this is purely and simply an advertising circular.

Specifications for Electric Heating.

Very shallow is the material on which the statement is founded as to maximum warmth and comfort being obtainable through the medium of the Belling fires. The reader is told that 800 units of electricity, as the equivalent of 1 ton of coal, will give more warmth and comfort than any other fuel equivalent. If this were true, then why do the makers of Belling electric-fires allow for the purchase of part of the ration in coal, gas, or coke? If 800 units will do more in the way of heating than the other fuel equivalents, then, naturally, the householder should take all his "fuel," if he can get the appliances, in the shape of electric energy. But as he reads the circular, the householder, if he is sharp, will notice that the Belling adviser only suggests intermittent (not continuous) use for electric-fires. But he omits to explain why, if there is better value in the electric equivalent than in the others, he does not urge continuous use of electric heating. There is something structurally wrong about the argument of the circular. Take the first item as to what a Belling 2-KW.-hour fire will do. It is stated that "your breakfast *or* bed room [note the or!] can be made comfortable on 400 cold mornings *or* evenings, for one hour on each occasion, for over two years." Let us see how far this will really hold good. Assuming the electric-fire in a bedroom is used for only one hour on a cold morning, this means two units. Assuming the fire is lighted one hour before and while retiring, this means another two units. There must be breakfast; so a further two units will go. This would be six units per day for these temporary warmings-up, without heating at any other meals provided for, and without the heating for all the rest of the day arranged for. Later on it is stated that it may be taken heating will be required on 180 days in the year. Six times 180 make 1080 units for heating for a brief space per day only two rooms. Even with the artful "or" in the quoted statement, it is impossible to accept the assertion,

The drawing-room, too, it is pointed out, may be warmed "for years" by 800 units during occasional visits of friends. This merely shows that the Belling people do not desire householders in the cause of electric-fire economy to have many visitors. Later on, an example is supplied of further contraction of intermittent use of electric-fires in order to realize economy, which again does not support the declaration that 800 units will give "more warmth and comfort than any other fuel equivalent." Of course, Belling knows that if the statement were true, electricity would be employed for continuous heating as well as for intermittent heating. A seven-roomed house is used as an illustration. Installed in each of the three bedrooms is supposed to be a 1½-unit-per-hour electric fire, which is only allowed a "full-on" use for two periods of half-an-hour each day. The three bedrooms under these close-cropped circumstances would use 4½ units. It would be necessary to hurry to bed, and hurry to dress in the morning. Then two meals out of three must be hastily taken. Using in the dining-room a two-unit-per-hour fire for two periods of half-an-hour each "full on," and "half-heat" for one period of two hours per day, four units would be metered. Employing a three-unit-per-hour fire in the drawing-room at varied heats per day (the householder must regulate the heats with mathematical accuracy) would require "about" 1½ units. The total use of electricity per day would thus be ten units. What the household is going to do between whiles for "warmth and comfort" can only be by using an alternative in the shape of coal, gas, or coke! All this, taken in conjunction with the preliminary assertion as to the electric equivalent being the superior, is very grotesque when examined from the practical point of view of the householder. Frugal use of electricity is the real message of the circular.

Effective Heating and Costs.

In the first reference to breakfast-room, bedroom, and drawing-room, when showing what 800 units of electricity can do, the Belling people ask, What other form of heating could claim such results? But heating results are not given. They are very guardedly avoided. Only meagre prescriptions are vouchsafed. The answer to the question is that any one of the other equivalents in coal, gas, or coke can in heating value "knock spots" off the electrical equivalent of 800 units. If Belling desires us to give electric-heaters 100 p.ct. efficiency against the claims of truth, we will temporarily (to save complication) do so. The 800 units can only yield 2,736,000 B.Th.U. At 1d. per unit the 800 units will cost £3 6s. 8d. But the war-time price of electricity for heating is in many cases 1½d., 2d., and 2½d. Take the middle figure, the 800 units would cost £6 13s. 4d. The 15,000 c.ft. of gas would give on combustion, at the parliamentary standard of 500 B.Th.U., 7,500,000 B.Th.U.; and the modern gas-fire puts into a room from 70 to 75 p.ct. of the heat produced. This would be 5,625,000 B.Th.U. obtained, at the war price of 4s. per 1000 c.ft. of gas for £3. That is to say, taking war prices for both electricity and gas, the latter will give more than twice the effective heat at less than half the cost. We come to the house which is allowed only ten units of electricity per day for heating. The circular says it may be taken that heating will be required for about 180 days in the year; and "taking the average consumption of 10 units, the consumption per year," for the altogether ridiculous amount of "warmth and comfort" afforded (this is not in the circular), "would be 1800 units, which is equivalent to 2¼ tons." "The balance of 3¼ tons [? 3¾ tons] can be taken partly in coal, gas, or coke as preferred." The Belling circular does not seem to touch the question of cost, beyond a warning against accepting theoretical measurements. On the other hand, householders may be warned that neither the Belling people nor anyone else can make a unit of electricity yield more than 3420 B.Th.U. Now the 1800 units of electricity cannot develop, given even 100 p.ct. efficiency, more than 6,156,000 B.Th.U.; while 2¼ tons of coal, at 14,000 B.Th.U. per pound, is capable of developing 67,500,000 B.Th.U. Even assuming 80 p.ct. of this is lost, the effective heat would be 13,500,000 B.Th.U.—more than double that of the 1800 units of electricity used. The 1800 units at 2d. per unit would cost £15; 2¼ tons of coal at 45s. per ton, £5 1s. 3d.! The Coal Controller's gas equivalent for the 1800 units of electricity and the 2¼ tons of coal would be 33,750 c.ft., which on combustion would develop 16,875,000 B.Th.U.; and 75 p.ct. heating efficiency would give 12,656,250 B.Th.U. The cost of gas at 4s. would be £6 15s. About 16,000 c.ft., at 75 p.ct. efficiency, would give the same heating value to the rooms, as the 1800 units of electricity; and the cost of the 16,000 c.ft. at 4s. per 1000 c.ft. would be £3 4s., as compared with £15 at 2d. per unit. In the circular, we read: "Do not be mislead [*sic*] by arguments comparing the number of B.Th.U. in a ton of coal or 1000 c.ft. of gas, or a unit of electricity." To that we should say to the householder: "Do not be misled by assertions of such a circular as that issued to boost Belling electric-fires, but ask for their practical substantiation before acceptance." Otherwise there may be profound regret. We will go further, and ask the Belling people whether they are prepared to take their own modern electric-fires (we presume they will say that they are the best procurable, even better than the Bastian kind) and modern gas-fires, and indulge in heat tests (even of the part passing up the chimney from gas-fires) with a representative of the gas industry to disprove the accuracy either of their own assertions or our figures, which include the passing of heat up the chimney. We shall be pleased to publish the results to the world, using the Belling circulars for the foundation of an article.

Electricity Generation and Electric-Fires.

We have not yet done with the Belling "fuel-rationing" literature. The statement is made that use of Belling electric fires reduces the amount of raw coal required—not at the electricity station. One of the circulars intimates that only 3 lbs. of coal are needed to produce 1 unit of electricity. This is a grossly misleading statement if applied to the central electric stations of the country generally. If the Belling people had kept themselves closely in touch with official data as to the coal consumption at electricity stations in the country, they would have well known that there are isolated examples of stations that, under specially favourable circumstances owing to industrial load, work at somewhat under 3 lbs. per unit; while in all other cases there is a variation of the amount used running between 3·09 and 16·92 lbs. per unit generated, which does not mean delivered at the consumers' terminals. Leakage would increase the consumption of coal per unit sold. In another circular, we see that "the great object of the Coal Controller at the present time is to reduce the amount of raw virgin coal used;" and "electric heating in towns where there is a supply of electricity available is one of the surest ways of reducing the amount of coal used *in the home*." But not at electricity stations with which we are acquainted. One of the "great objects of the Coal Controller at the present time is to reduce the amount of raw virgin coal used" at electricity stations. A 1½ KW. Belling fire would (as is obvious) use per half hour ¾ unit of electric energy. The householder is told that to generate this ¾ unit of electricity at the power station would need about 2½ lbs. of coal; while "to get the same comfort from a coal fire would require about 6 lbs. of coal"—saving in raw coal 3¾ lbs. The 2¼ lbs. (3 lbs. per unit) as already seen, is the exception, and not the rule. The ¾ unit of electricity used in an electric fire, at 100 p.ct. efficiency, would give 2565 B.Th.U. The 6 lbs. of coal referred to would have a calorific value, at 14,000 B.Th.U. per lb., of 84,000 B.Th.U.; and 20 p.ct. of this would be 16,800 B.Th.U., compared with 2565 B.Th.U. for electricity. Is it likely the householder on a cold day would get "the same amount of comfort" from the latter figure as from the former? But Belling indulges in prophecy. "As soon as the super-power stations start work, you will do everything in your home electrically. You will not need coal or gas; and the amount of the coal raised will probably be halved." The Belling people probably do not know that there is a limit to the power of generating sets to effect fuel economy; and that there are costs attaching to super-power stations which do not apply to the smaller local stations. The super-stations in view have not yet been planned; and the extent to which they will (if at all) reduce costs from the best working of the existing local stations of electricity delivered to the consumer is a matter that has yet to be proved. There are many eminent electrical engineers who have no faith in the ability of such stations to effect all that has been prophesied. Round about these castles in the air there have grown much speculation and extravagance—an extravagance which has reflection in the Belling literature dealing with the Fuel Rationing Order.

Temporary Increase of Charges Act.

The Board of Trade intimate that further applications have been made to them under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, up to the 17th inst., by the following undertakings: Burnham Gas Company, Ltd., Cardiff Gaslight and Coke Company, Dover Gas Company, Houghton-le-Spring District Gas Company, Southend Water-Works Company, Swansea Gaslight Company.

Oil-Storage Tanks.

Losses of oil in storage and methods of prevention are discussed by Mr. C. P. Bowie in a Bulletin of the United States Bureau of Mines. The author states, as a result of his investigations, that all-steel tanks give the best results; and where large containers are required, he recommends concrete-lined reservoirs. Practically all such containers in use at the present time have wooden roofs; but it is his belief that concrete roofs would be far more satisfactory in every way, and that the difference in cost between the two would be offset in a few years by a saving of oil and in cost of repairs and renewals. On the question of painting, it is reported that tests have demonstrated that evaporation from tanks painted white averages about 1 to 1½ p.ct. less than from tanks painted red, and about 2½ p.ct. less than from tanks painted black. These figures, the author says, have not been verified; but tests made by the Institute of Industrial Research show that dark-coloured paints absorb heat to a considerable degree, and paints presenting a highly glossy surface are less absorptive of thermal rays than those presenting a matte surface.

Scottish Junior Gas Association (Western District).—The opening meeting of the session will be held in the Royal Technical College, Glasgow, next Saturday, when Mr. Thomas G. Moffat, of Tradeston, will deliver his Presidential Address. Mr. Moffat, who was Vice-President, has become President now, owing to the resignation of Mr. D. T. Marwick, who has taken up an appointment with the Oxford Gas Company.

THE VITAL INTERESTS OF MUNICIPAL AND COMPANY OWNED GAS UNDERTAKINGS.

[COMMUNICATED.]

Now that the reconstruction of the National Gas Council is imminent, it is time that the relationship of the vital interests of municipal gas undertakings and gas companies was fairly and fearlessly examined and discussed.

Mr. Carpenter's letter in the "JOURNAL" for Oct. 1 is proof enough that there are differences—serious and fundamental differences—which must be cleared up before any one really "National" Gas Council can speak and act for the whole gas industry. We must not shut our eyes to these differences, and pretend they do not exist, or true welding can never take place. We want no patched-up affair. The only possible way with any hope of success is to frankly admit that there are differences, and see if they are real and vital, secondary, quite minor, or imaginary. If these differences are found to be real, vital, and unalterable under present conditions, then it is useless to expect a National Gas Council to speak for the gas industry as a whole. On the other hand, differences can often be removed by publicity, and both sides united into one strong whole. The policy of pretence, backstairs methods, and cant will have to finish if true reconstruction is to take place after the war. The secret nursing of differences of opinion and grievances has been the cause of many of the distressing labour strikes during the last two years. The policy now adopted by the Government and the Press in fully explaining the points of view of both sides, has done much to right the recent labour troubles. We must have a similar open expression of views from all opinions if unity is to be really attained.

At first glance, it appears that, except for conditions of capital, the veto of the municipal council over the gas committee, and labour conditions, the interests of municipal gas undertakings and gas companies are identical. But are these the only real differences? And are these differences of vital importance? Let us examine these points in detail. At the outset, it must be admitted that every gas concern, whether company owned or municipal owned, has its own particular differences from every other gas concern, and complete uniformity of policy is impossible, and, in fact, undesirable; for local conditions must be taken into account and local interests catered for. But the general policy and working of gas concerns can be roughly divided into two distinct parts. First, the executive policy, which would include conditions of capital, labour, legal obligations, relations to the public, progressive outlook, &c. Second, the technical policy, which would include site of works, type of plant, &c.

If we examine the second part of this division of general policy, we shall see that, under present conditions, every gas concern which has its own technical experts will have its own technical policy. Gas engineers have no standard training—there is no central training college. One who starts life as an articled pupil to a gas engineer and passes through one or two other works in the capacity of an assistant will naturally have his prejudices for particular types of plant with which he is familiar, and among which he has been brought up. In this respect, gas engineering differs greatly from electrical engineering. The latter has almost everything standardized by numerous makers of plant; and it is rare that an electrical engineer is called upon to design part of the plant in his power station.

The existing District Gas Associations offer ready means for interchange of ideas about the design of plant and the working results obtained therefrom. No central authority could hope to achieve very much more than these Associations in this direction. Questions such as horizontal *versus* vertical retorts, water-gas manufacture in the carbonizing retort or in separate plant, high or low pressure distribution, &c., must be largely left to the technical expert of each gas concern who understands the local conditions, such as what coals are available and what site and type of plant has to be utilized. A central research station would be of very little use without taking into account local conditions; and it is probably better for general progress for every responsible gas engineer to be left to judge between types of plant, and advise his committee or directors accordingly. Thus we see that a National Gas Council cannot expect to do much more than existing organizations for the purely technical policy of gas concerns.

The remaining part into which we have divided the general policy of gas concerns, and called executive policy, is where the possibility of real unity lies, and where the differences between municipal and company owned concerns lie also. We will here examine a few of the more obvious differences, and see if they are vital or only of secondary importance. Of course, the most obvious difference is in constitution. But this needs no elaboration. The management of a gas concern by a committee on the one hand, and directors on the other, should under normal conditions show no very great differences. As most gas companies have a legal limit as to the profits they can make, there is no fear of the public being exploited. Directors of gas companies naturally take an interest in the economical working of their concern, for they have their own interests at stake at the same time; and it is almost an axiom that a man will work better for himself than for others. On the other hand, a member of a gas committee is liable to be influenced by the popular wants of a section of his electorate. The custom of many municipal councils in having a new gas committee chairman every three years is also a great disadvantage. The general tendency of municipal management, except in large progressive manufacturing towns, is to restrict rapid progress and pander to small local interests.

It is a well-known fact that gas engineers, on the whole, prefer to work with directors rather than with a municipal committee. Employment with a municipal council is almost invariably more poorly paid in the higher branches of service than corresponding berths with a company. One prominent member of a gas committee was heard to say that no man was worth more than £300 per annum in any employment. This naturally tends towards a movement of young progressive gas engineers away from municipal service. Backstairs methods are all too frequently prevalent in municipal council working. These methods advance minor interests at the expense of general progress.

Turning to the conditions of capital, we see a fundamental difference. A gas company has to stand on its own, whereas a municipal undertaking has the whole rateable value of the district at its back. The operations of many municipal electricity undertakings which are worked at a loss, with the aid of rates, in opposition to a gas company, is an illustration in point. On the other hand, the policy of many municipal authorities in appropriating large sums of the profits, above the bare interest on the capital involved, in aid of local rates is a direct hindrance to general progress.

The conditions of employment of labour on municipal and company gas-works differ in a similar manner to the conditions of capital. The company has to stand alone; whereas the municipal undertaking usually acts in labour questions in conjunction with the other municipal departments. Thus the special conditions applicable to a gas-works are often obscured by this collective handling of several dissimilar departments. The fact also that several municipal councils are labour controlled makes joint action with companies fundamentally different, and often difficult. But if the Whitley scheme is applied throughout the country, and gas-works labour is treated separately from other municipal departments, the present difficulties should be removed.

Generally, throughout the country gas companies have more highly-organized selling departments than municipal undertakings, with the exception of the undertakings in large progressive manufacturing towns. Naturally, a gas company is out for increased business; for the interests of its directors are increased at the same time. With municipal undertakings, the keenness for increased business largely depends on the officials. Many municipal undertakings do no gas-fitting work at all, owing to successful opposition by local tradesmen. There is more than one instance in the country where a municipal gas undertaking does no fitting work, where no tradesman will fix gas apparatus unless he supplies the apparatus also, and where an adjoining gas company does a fair fittings trade in the area of the municipal undertaking. These conditions all hinder progress.

The legal obligations of gas companies are also often really different from those of a municipal undertaking, though they are similar in theory. The law relating to purity and quality of the gas supplied is in most cases enforced by the local municipal council through its watch committee. This gives a municipal undertaking loopholes which a gas company does not have, especially if it is in competition with a municipal electricity undertaking. A company has usually to meet real competition, whereas competition between two municipal undertakings in the same area is only superficial, and any that does exist is only between the officials of the two departments. The veto of the whole council over the gas committee is also a hindrance to the gas industry as a whole; for the entire council can hardly be expected to know anything about gas policy except in so far as a particular question affects their own district. Thus, it often happens that quite minor matters assume first importance, with consequent damage to the industry as a whole.

It must be admitted that most of these differences are real and vital; and before any comprehensive scheme for a National Gas Council can be really successful, these and other points of difference must be thoroughly examined. No detailed suggestions for removing the differences are offered. But there are two general ways in which this could be done. One is for municipalities to take over all gas companies; the other is for legislation to be introduced compelling municipalities to treat their gas undertakings as separate concerns, with a limited profit to be consumed by capital charges only, and for labour conditions to be uniform for all gas-works, whether municipally owned or company owned. At the same time, if we are to have real reconstruction throughout the country, the very best type of man must serve on municipal councils and boards of directors, and manage gas undertakings with a view to the general good of the community and industry as a whole.

Gas Companies' Protection Association. — The twenty-first annual meeting of the Association will be held on Thursday next week, at 3 p.m., at Central Hall, Westminster. The business to be transacted will be to receive the annual report, the accounts and balance-sheet for the year, to elect seven members to serve upon the Committee in place of those retiring under the rules of the Association, and of Mr. Thomas May, deceased, to elect two Hon. Auditors, and to transact any other general business that may be brought forward.

MILITARY EXPLOSIVES OF TO-DAY.

THERE have now been reprinted in the Society's "Journal" a series of Cantor Lectures delivered before the Royal Society of Arts earlier in the year, on "Military Explosives of To-day," by Mr. J. Young, O.B.E., A.R.C.S., F.C.S., Chief Instructor in Science at the Royal Military Academy, Woolwich.

When dealing with high explosives for shell-filling, the lecturer explained that the basic substances required for the manufacture of the newer forms of explosives are obtained from coal. When coal is carbonized in the manufacture of gas, 16 to 20 gallons of tar per ton are obtained, containing about ½ lb. of benzene, toluene, and xylene. The gas contains about 1 p.ct. by volume of the vapours of the substances, equal to about 19 lbs. per ton of coal; and under war conditions, from 13 to 20 lbs. of these mixed hydrocarbons in the form called benzol are extracted from each ton of coal. The composition of the benzol varies with the quality of the coal used and the process of stripping. It contains from 50 to 70 p.ct. of benzene, 10 to 40 p.ct. of toluene, 1 to 3 p.ct. of xylene, and smaller amounts of naphthalene and acids. There is, of course, a great demand for toluene; but the benzene is also used as a nitro compound in explosives, and in a synthetic process for making phenol. The next fraction from coal-tar distillation contains phenol, which is used for making picric acid.

Tri-nitro-toluene, the lecturer explained, is at present the most important of the shell high explosives. The toluene intended for this purpose must be pure, clear, and water white. The complete conversion into the tri-nitro is a long and difficult process; and various methods are employed. However, the conversion by a continuous process in one operation has been greatly improved recently, and is now much employed. The special qualities of "T.N.T.," which have caused it largely to replace picric acid as an explosive are its lower melting-point, the fact that it is a neutral substance, and because it can be mixed safely with oxydizing agents. As little as 10 p.ct. of "T.N.T." mixed with ammonium nitrate gives an explosive as powerful as the pure substance itself. The amatols thus made more than double our resources as regards high explosives. Amatol is the most used of all the shell high explosives at present. Tri-nitro-benzene is made by the nitration of benzene with mixed nitric and sulphuric acids; but the process is a long one, and full nitration difficult. This has prevented its being used to any great extent. It resembles "T.N.T.," but is a more powerful explosive.

ECONOMICAL WATER HEATING.

PERHAPS the "Housing Question," in which the gas industry is vitally concerned, has done as much as anything to deepen interest in heating water by gas, and particularly to concentrate on doing this economically.

Taking a small house, for example—as it is in these, in their coming tens of thousands, that special interest is felt—a little thought will convince anyone that the quantity of heated water required for a bath is very different in bulk and temperature to that required for any other purpose. There are, in fact, these two very different demands for hot water: (1) A bath or baths; and (2) all other purposes. It is a very small bath that is sufficiently filled by twenty-five gallons of water; but the many other purposes (of a small house), such as washing-up a few plates, a pailful now and again, hand-washing, &c., are well supplied if five gallons of hot water are available, if really hot.

In the coming small property there is a certainty of a large number of the houses having upstairs bath rooms (already a large number are built in this way); and this entails having hot-water apparatus to serve the bath and scullery sink. The apparatus, however small, will consist of a boiler connected to a storage tank by the customary circulating pipes—the storage tank holding perhaps twenty gallons, so as to be suitable for the bath.

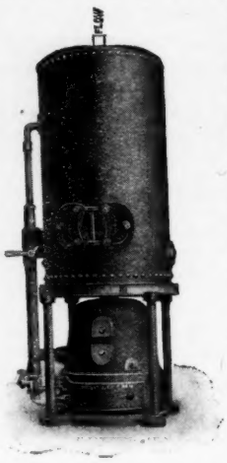
As ordinarily erected, a hot-water apparatus has the whole contents of its storage tank heated, quite regardless of whether the water is wanted for a bath or two gallons of it for washing up the breakfast things. And while the bath may require the twenty gallons storage for one hour per week, the remaining hundred day-hour requirements do not require a storage exceeding four to six gallons. Put briefly, it is usual for the twenty-gallon storage to be heated and kept hot all day and every day for demands easily met by five gallons storage.

When a coal-burning range does the heating, it may not matter so much, as the fire is kept alight at all times—for they cannot keep letting it go out and re-lighting it; and, whether wastefully employed or not, the fire is giving heat to the water, and an unnecessary storage may not make matters much worse than a more proper storage would do. Of course, there are always the loss of time and the annoyance of heating up twenty gallons when a much less quantity would do.

When gas is used for heating water, waste is worse than unnecessary—it is fatal, especially at these times; and all means of eliminating losses, unnecessary heating, &c., are acceptable.

Messrs. John Wright & Co., of Birmingham, have designed what they call the "B.T.U. Builders' Set" to meet the want now being discussed; and some idea of its suitability can be formed rom the fact that a committee appointed to decide on the fittings for a new estate, found this outfit most suitable for the purpose, and a first order for 250 sets is now being installed. The special feature of the arrangement is the "Economy Valve."

The complete apparatus consists of a "B.T.U." gas-heated circulator, above which is a cylindrical storage tank—the two working together by circulating pipes.



The water, as heated, is delivered from the boiler to the top of the storage tank; so that, as fast as it is heated (little or much), it is available at the taps. The important detail is the duplicate connection of the return circulating pipe and the "Economy Valve" inserted in it. This arrangement gives two distinct active capacities to the tank, according to the position of the valve-handle. When the valve is open, the whole contents of the cylinder are in active circulation—this being very necessary for the comparatively few and brief periods when a bath is to be taken. At all other times the valve is closed, which at once puts three-fourths of the tank's contents out of circulation, leaving only sufficient water active to meet any demand up to (say) five gallons, which in a short time reaches a good temperature for dish-washing. Thus for all days and all hours, except the occasional bath hour, the water being heated and kept hot is the minimum, though sufficient, supply, and, needless to say, the gas consumption is lessened accordingly.

Of course, the thermostat is as essential as ever in controlling the consumption of gas by the heat of the water. But when it is seen how the gas will be automatically cut-down when five gallons are heated, instead of being full on until twenty gallons are hot, no doubt is felt as to economy resulting. Again, the storage tank will probably have 12 sq. ft. of surface—all active heat-losing surface if its whole contents are hot; but this loss is also brought-down when a relatively small area only has hot water in it.

The action of the "Economy Valve" is, putting it in few words, to make the storage tank act either as one of twenty-gallon capacity, or one of five gallons with all the attendant advantage of lessened consumption and lessened losses for the long periods when baths are not required.

It may be desirable to give a word of explanation as to how a twenty-gallon storage cylinder can be utilized as a five-gallon storage (for hot water), although the tank holds and contains twenty gallons all the time. The explanation is this. Wherever the return pipe terminates is equivalent to being the bottom of the tank, as any water below this point does not then circulate through the boiler. The water below the level of the return-pipe connection may be considered as part of the cold-supply service, only entering the active area in the tank when it rises up, due to someone drawing hot water from a tap. But, it may be asked, will not this large bulk of cold water in the lower three-fourths of the tank have a prejudicial effect upon the heated water above it? The answer is that the heat from the upper water will not be dissipated downwards through cold water; in fact, if there was an ordinary sheet-metal bottom beneath the upper hot water, there would be more heat lost through it than can occur downwards through stationary cold water. It is scarcely too much to say that the lower cold contents of the tank (when the "Economy Valve" is closed) serve almost as well as a lagging in preventing heat loss in this direction.

The "B.T.U." circulating boiler, which forms the lower section of the "Builders' Set," is heated by gas with a draw-out non-lighting-back bunsen burner; and there is a separate draw-out pilot light. The boiler is fitted with a positive-acting thermostat—a patented automatic non-capsule valve, which cannot get out of order or out of adjustment.

A Composition Fuel.

An American patent for a composition fuel is controlled by the Industrial Fuel Corporation of New York, who report that steady progress is being made in its introduction. The fuel is a mixture of approximately 95 p.ct. of anthracite coal dust screenings, or mine slush, with about 5 p.ct. of water-gas tar. The first gas company to put the fuel into practical use in the works has had excellent results. In use there is freedom from smoke; and from a boiler-room standpoint the fuel is eminently satisfactory. Upon various tests, the fuel has shown a calorific value as from 12,000 to 14,000 B.Th.U. to the pound, according to the grade of culm, slush, or screenings used as a base. In one of the tests, a boiler was run for a day upon ordinary coal, and then for one on the composition fuel. With the latter, the boiler developed well in excess of its rated capacity, and about one-and-a-third times the capacity developed under coal firing. In practice it has been found that the amount of ash and refuse from the composition fuel is reduced to a minimum. The fuel is fired in the same way as ordinary coal. Where water-gas tar is now used as a liquid fuel under boilers, it is claimed that a conservation of over 75 p.ct. by volume of water-gas tar is effected through substitution of the composition fuel.

MODERNIZATION OF PLANT.

By H. C. WIDLAKE, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

"The old order changeth, yielding place to new."—
"The Passing of Arthur."

IN this age of invention and progress, the significance of Tennyson's immortal lines are continually being brought home to us, and few of us realize their prophetic truth more than does the engineer who sees the various units of his plant becoming candidates for the South Kensington Museum long before the machines themselves show any tangible signs of depreciation. In many such cases, however progressive the technical views of an engineer may be, he has first of all to consider the interests of his shareholders, and must often be content to go on working with an out-of-date machine until such time as he is satisfied that the comparative degree of antiquity which years of service has conferred upon it has caused it to become a financial, and not merely a technical, eyesore. The question as to whether a machine has become out of date from a financial standpoint is one which has a special interest for gas engineers, in so far as it concerns their stoking machines; and many engineers, although they may chafe at the thought that the stoking machine they are using has been considerably improved upon in later models, cannot advise their boards of directors that the improvements are such as to warrant the scrapping of a machine or machines which may be good for many years of further service.

An alternative course to the scrapping of such machines lies in the application to them of improvements which have been embodied in a later model—provided, of course, that this is mechanically possible. But a frequent objection to such a course is that it involves (or is thought to involve) the laying-up of the machines during the time that the modifications are being applied.

This objection carries all the greater weight in the case of a single machine installation, when it would be necessary to resort to hand-charging in the event of the machine being out of commission; and it often happens that labour considerations, or else the character of settings which have been built solely with a view to machine-charging, quite rule-out the possibility of charging the retorts by manual labour, and so put an end to any chance of modernizing the plant.

In the course of a long experience with modern retort-house machinery, the author has made a close study of such cases, and has carried out many important alterations to units of plant which could not possibly have been allowed out of commission for more than a few hours. In many of the cases, the actual work done has taken several months; but the stoppage of the plant while the final break was being made has only taken a few hours.

A TYPICAL ALTERATION.

In this article he proposes to describe how a big alteration was carried out in respect to one of the early types of Fiddes-Aldridge stoking machines in such a manner as to put the machine out of commission for only twelve hours, in spite of the fact that the entire job took some six weeks, during which the time the machine fulfilled its ordinary routine duties—all the work involved being carried out between the charging rounds, with the exception of the last twelve hours of the job, when the final break was made.

The author wishes to render it quite clear that the remarks in this article have no allusion to, or bearing upon, the new type of Fiddes-Aldridge simultaneous machine, which is now being developed with a view to the requirements of large works. Apart from this fresh development, the most radical alteration in the history of the Fiddes-Aldridge machine has been the addition of an extra motor for travelling—a modification for which the writer was responsible, the first machine so fitted being put to work in the No. 1 retort-house of the Coxside works of the Plymouth and Stonehouse Gas Company in October, 1913, since which time it has worked with a degree of success which has more than justified so radical a departure from Messrs. Aldridge and Ranken's [then] standard design.

ADVANTAGES.

The advantages which have been found to accrue from the adoption of a separate travelling motor are as follows:

(A) The machine takes up its position in front of a retort, and is ready to charge it in a much shorter time than is possible in the case of a single-motor machine, owing to the fact that the necessity for the withdrawal and engaging of heavy dog-clutches is done away with; the change-over from the travelling to the stoking motion and *vice versâ* being effected by the throwing-over of a change-over switch which a small child could operate.

(B) Controller maintenance is greatly reduced, owing to the absence of that destructive arcing which takes place when the motor has to be "edged" round, in order to engage and release the respective clutches.

(C) The stoking motor operates nearer its rated capacity at a lower temperature; and the duty on both this motor and the transmission gear is greatly reduced.

(D) The absence of the heavy travelling gear-box on the inner frame gives greater facilities for inspection and for the carrying out of running repairs.

(E) Owing to the reduction of frictional losses, the travelling gear possesses a higher mechanical efficiency, and operates at any given speed with a correspondingly smaller consumption of current.

(F) Experience has proved that the cost of mechanical maintenance is tremendously reduced with a two-motor machine compared with similar costs in the case of a single-motor stoker with its mechanical complications.

These are a few of the purely mechanical advantages which can be obtained from the installation of a separate travelling motor. But by far the greatest advantage lies in the fact that, owing to the speed and ease with which the machine operates from retort to retort, its capacity (on the basis of the number of settings with which it can deal) is increased between 30 and 40 p.ct. To put this in other words, a single-motor stoker which has been employed upon (say) sixteen settings of retorts will be found capable, if fitted with a separate motor for travelling, of handling at least twenty-two or twenty-four settings in the same time and with the same labour as were previously required for sixteen settings. It has also been proved that, as a result of the rapidity with which the machine can approach and leave a retort, and the consequently shorter time the mouthpieces are open, a much larger make of gas per ton will be secured than was possible with the older type of stoking machine.

RESULTS.

In order to illustrate this point, the writer proposes to include in this article some test figures regarding a "F-A" installation which were published in an article, entitled "The Evolution of the Modern Charging-Discharging Machine," which appeared in the March 21, 1916, issue of the "JOURNAL," and from which an extract is here quoted:

"The following figures give the results of a test taken with a view to determining the relationship between the bulk of material handled, the electricity consumed, and the time-factors of the different motions. No mention is made of the raising-lowering motion, as (in the case of settings in a reasonable state of repair) this motion is used to so small an extent as to render its effect upon the working costs negligible. The conditions were absolutely normal; no effort being made to speed-up the operations. The test was taken haphazard on a typical charging-discharging round of thirty-five minutes. The performance shown is not by any means out of the common. As a matter of fact, the time per retort could have been improved upon had the operator been instructed to get over the ground as quickly as possible.

"It will be observed that in the data immediately preceding the table, the consumption of electrical energy is stated to have been 4 B.o.T. Units or 0·097 unit for each retort charged and discharged; whereas in the table itself this figure is given as 3·362 B.o.T. Units or 0·082 unit per retort. The discrepancy is due to the fact that the first reading was taken by an integrating wattmeter, and may therefore be regarded as correct; while the consumption shown in the table was estimated on the basis of observed average amperes, the time, and the average pressure. While the latter figures could have been adjusted to the watt-hours as shown by the wattmeter (which was known to be correct), the author considers that such a procedure would rob the record of much of its value, as it is obvious that only by a very strange coincidence could the estimated wattage in a circuit where all the factors were continually varying be calculated so closely as to check accurately against a wattmeter record. The times of the different operations were taken by a stop-watch, while the average current was estimated by a series of visual observations on a testing ammeter. And considering the varying nature of all the factors, it will be seen that the figures in the table, brought to a wattage basis, and compared with the recorded kilowatts, are in themselves an excellent testimony to the care with which the test was carried out.

Particulars of Test No. 1.

Type of machine	Simultaneous
Number of motors	Two—stoking and raising combined and travelling separate.
Number of retorts charged	41 retorts, 16 in. by 22 in. by 20 ft. through
Distance travelled by machine between first and last retort	About 240 ft.
Time taken (total)	35 minutes
Time taken (per retort)	51 seconds
Electricity consumed (total)	4 B.o.T. units
Electricity consumed (per retort)	0·097 B.o.T. unit
Total coal charged	8 tons 6 cwt.
Average charge	8·1 cwt.

Table Showing Particulars of Operations.

Operation.	Time.			Electrical Energy Consumed.		Average Observed Current.
	Per Retort.	Total.		Per Retort.	Total.	
	Minutes.	Mins.	Secs.	B.o.T.U.	B.o.T.U.	Amperes.
Discharging and charging simultaneously	16	10	56	0·039	1·599	40
Withdrawing chain from retort	12	8	12	0·026	1·066	35
Travelling	8	5	28	0·017	0·697	35
Total	36	24	36	0·082	3·362	—

TEST NO. 2.

"These figures are confirmed by an earlier test taken by the writer on the same machine, and under the same conditions, in September, 1914. In this case, the test extended over a period of two weeks, during which time 2075 tons of coal were handled, and 5188 charges of 8 cwt. (average) were placed in, and discharged from, a corresponding number of retorts. The watt-meter for recording the consumption of electrical energy was calibrated by its makers before the test, the results of which are as follows:

"Duration of test	14 days.
Coal carbonized	2075 tons.
Number of retorts charged	5188.
Average weight of charge	8 cwt.
Electricity consumed (total)	482 B.o.T. units.
Electricity consumed (per retort)	0·093 B.o.T. units.
Electricity consumed (per ton of coal carbonized)	0·23 B.o.T. units.
Tons of coal handled per B.o.T. unit	4·35 tons."

Interested readers are invited to compare the above figures—particularly those relating to the first test—with the performance of their existing single-motor machines, when it will be obvious that the money expended in the provision of an additional motor for travelling will prove to be a remarkably good investment.

In this contribution, the writer proposes to show that any existing old type Fiddes-Aldridge machine can be so altered without being laid aside for any serious length of time and with no greater total delay than would be caused by (say) the breakage of a vertical travelling shaft or a travelling axle, in which event (where there is only one machine) a few hours' delay must necessarily take place.

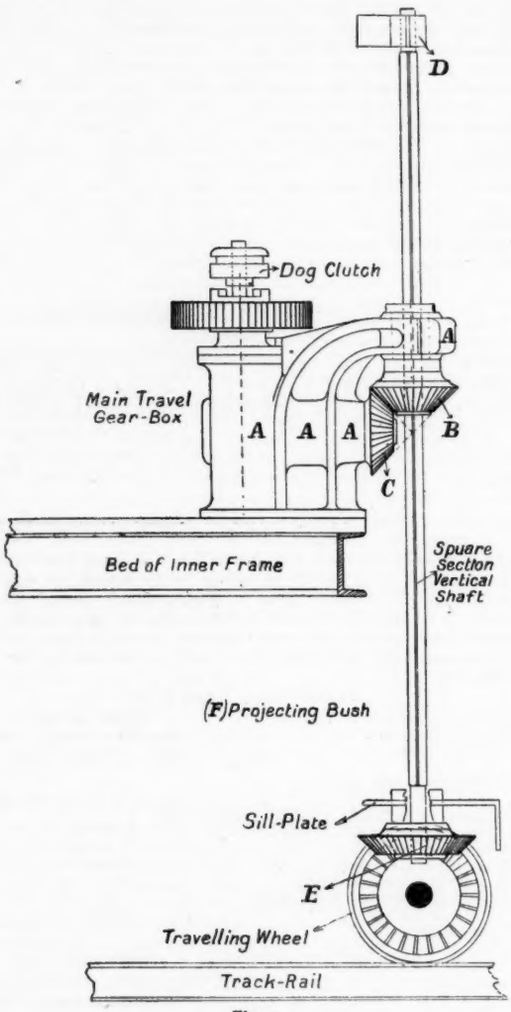


Fig. 1.

Before proceeding to a detailed description of the actual manner in which this work may be carried out, it may not be out of place to briefly review the whole job as it appears before commencing work.

AN OLD-TYPE MACHINE.

The earlier type of "F-A" machine has one motor installed (in most cases) on the inner frame, for the purpose of operating the three different motions—namely, the stoking, the raising, and the travelling motions. Now so far as the first two of these motions are concerned, no fault can be found with the general arrangement of the gearing; but when we come to inspect the method adopted for travelling the machine up and down in front of the retort-settings—bearing in mind the fact that the inner frame on which the single motor is installed, has in the case of a three-tier machine a vertical travel of at least 5 ft.—we come at once to a transmission problem which must, from its very nature, be necessarily complicated and inefficient. The single motor on the inner frame of the machine, driving through a worm-reduction box, sets in motion three spur wheels, each lying in the horizontal plane, and each forming one member of a dog-clutch, by which one of the three motions may be engaged with the single motor.

Fig. 1 has been drawn to illustrate the method of travelling in the earlier standard "F-A" machine; and it will be seen that one of these spur-wheels is shown—namely, the one pertaining to the travelling gear-box. This box is situated on the extreme edge of the inner frame, and carries a heavy projecting bracket; provision being made in the structure of the outer frame to allow the bracket to rise and fall with the inner frame. This bracket—marked A in fig. 1—accommodates a special form of bevel-pinion, lying in the horizontal plane, and being retained in the bracket by a heavy hub, in which a journal is turned. This pinion, B, is pierced with a 2¾ in. square hole. The outward projecting worm-wheel shaft of the gear-box carries a pinion C, which engages with the pinion B. The latter pinion is pierced with a 2¾-in. square hole for the reception of a vertical shaft of square section which passes up through the sill-plate, through this pinion (in which it is a sliding fit), and terminates in a bracket, D, attached to the top of the outer frame. At its lower end, it is fitted with a bevel-pinion, gearing with a bevel-wheel on the main driving shaft of the machine, as shown at E.

It will be seen that, as the inner frame rises and falls, the pinion B is free to rise and fall with the bracket in which it is held—sliding up and down over the square shaft; while any rotary motion which may be given to the pinion when the travelling gear-box is engaged with the motor will be communicated to the vertical shaft, owing to the latter being of square section and a sliding fit in the pinion B.

A MODERNIZED MACHINE.

Fig. 2 shows the improved form of travelling gear which forms the subject of this article. In this design the old travelling gear-box on the inner frame of the machine and the vertical shaft are entirely done away with; the entire power installation for travelling the machine being mounted on the sill-plate of the outer frame, as shown. Immediately over the point at which the old vertical shaft emerged from the sill-plate a small compact new gear-box is mounted, having a short downward projecting vertical shaft, passing through the bearing-bush previously occupied by the square section shaft, and carrying on its lower end a similar bevel-wheel to the one fitted to the shaft. This gear-box is fitted with a worm reduction gear; the worm-shaft being gear-driven by a small electric crane-type motor fitted on the sill-plate beside the box. A 10 H.P. machine is ample for this duty; the 9¾ "C" type Siemens motor being very suitable.

PRELIMINARY CONSIDERATIONS.

The main points of difference between the old single-motor and the new two-motor type of machine will have been readily grasped by reference to figs. 1 and 2; and it is now proposed to deal with the manner in which this modification may be applied to an old type machine.

It will be assumed that it is impossible to take the machine out of commission for any length of time, and that the greater portion of the work will be carried out between the stoking rounds. The chief portion of the work will be of a mechanical nature, and must be carried out by a skilled fitter; while in the later stage of the job a competent electrician will have to be employed for about two or three days upon the task of altering the wiring of the machine. The conversions carried out by the writer were in connection with a works where there was every facility for any mechanical or electrical work; but on a small works, where such facilities would not exist, it would probably pay to come to an arrangement with the makers of the machine to carry out the conversion.

The new material required for the work comprises a new motor of about 9 or 10 B.H.P., a new travellieg gear worm-box, and a change-over switch. The actual cost of the job must be set against the credit which will be obtained for the large travelling gear-box, which will be discarded, together with any spares for the old travelling gear which may be stocked; and it will be found that the net cost of the alteration will be a bagatelle as compared with the financial benefits that will accue from the adoption of the new type of travelling gear.

The fitting of the new motor and gear-box on the sill-plate constitutes by far the heaviest portion of the work. But the satisfactory operation of the modified machine will depend as much on the arrangements for controlling the new travelling gear from the driver's position on the inner frame of the machine as upon the heavier portions of the new gear; and the work of installing the control gear, and the cables leading therefrom to the travelling motor, should be carried out before the fitting of the new gear on the sill-plate.

METHODS OF CONTROL.

There are two methods by which the control of the travelling motor may be effected—viz., by means of a separate controller and resistance, or alternatively by the employment of a directional or change-over switch operated in conjunction with the existing controller. The latter method will be found preferable, as not only is it the least expensive, but it ensures a minimum of elec-

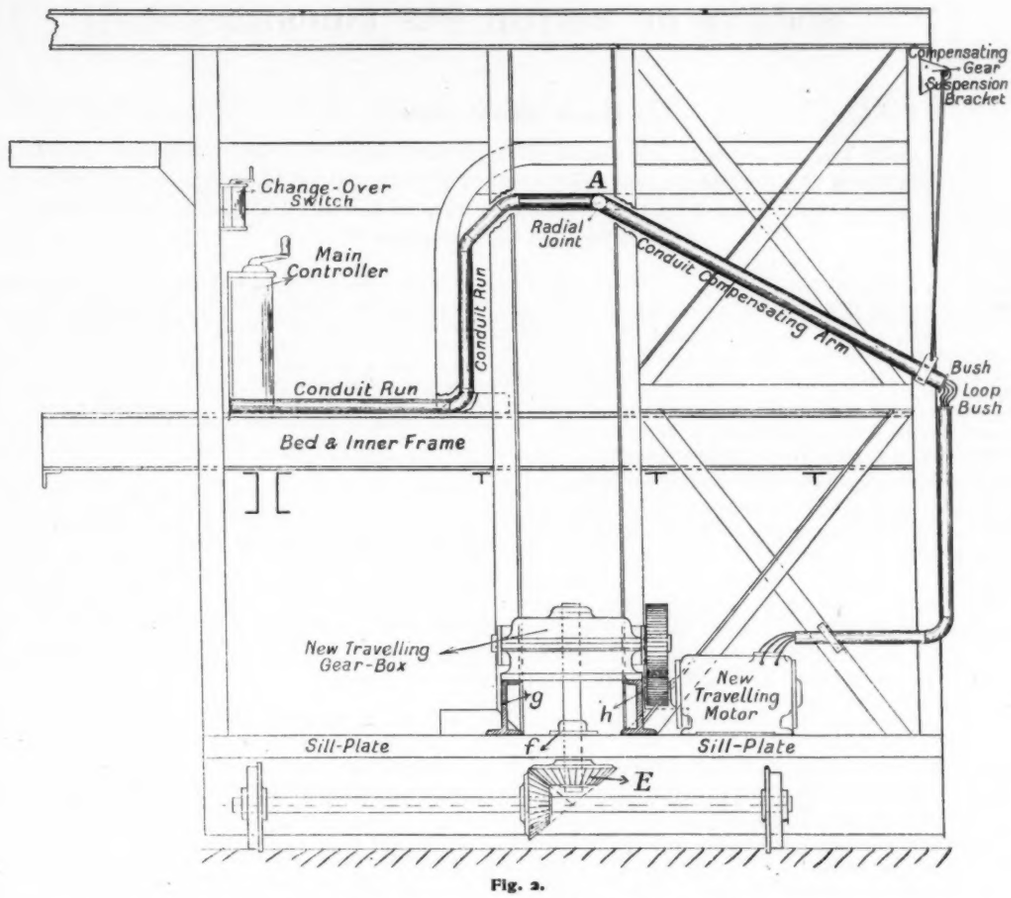


Fig. 2.

trical complication, and also obviates the necessity of installing additional bulky apparatus in the limited space available on the inner frame.

All that is necessary with this method is the provision of a comparatively small change-over switch fitted in a convenient position relative to the main controller, together with a run of four cables between this point and the new motor on the sill-plate. This change-over switch is a vital portion of the equipment; and it is no exaggeration to say that the satisfactory operation of the machine will absolutely depend upon the type of switch selected —the switch forming, as it does, a link between the main controller and the travelling and stoking motors.

From a purely electrical point of view, all that is required is an ordinary double-pole throw-over switch, with its centres interconnected; but when it is remembered that this portion of the installation has to be operated by rough labour several thousands of times per day, it becomes obvious that the ordinary switchboard fitment, even if enclosed in a cast iron case with an external operating handle, will not meet these conditions.

A Special Fitment.

The author's experience of change-over switches operating under severe conditions has not been a happy one; and in view

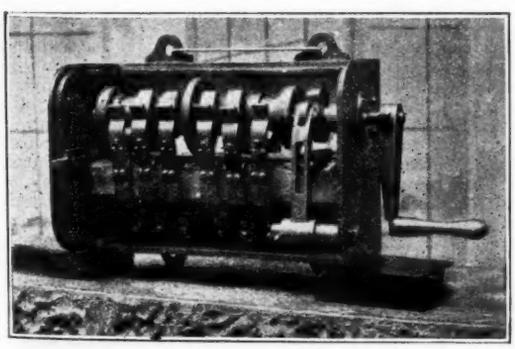


Fig. 3.

of the exceptionally hard usage which it was foreseen a change-over switch fitted for this particular duty would have to withstand, the switch illustrated in fig. 3 was designed by him and has proved an unqualified success. It was, of course, primarily intended for use on the two F-A machines at the Plymouth Gas Company's works; but its general construction is such as to render it adaptable for a number of special purposes.

Some idea of its efficiency and general robust construction may be gathered from the fact that one of these switches is still in use after having been operated between seven and eight million times in the course of the past four years. During this period it has cost less than 5s. in maintenance, and has never been the cause of a compulsory stoppage. This piece of apparatus, measuring about 12 in. by 8 in. by 6 in., is known as the "Widlake Change-over Switch."

Accidents Due to Gas and Electricity.—A chart has been prepared by the Industrial Commission of Wisconsin covering the three years 1915, 1916, and 1917, during which period every industrial accident in the State was investigated, and record made of the cause, and the amount of time lost through death or injury of workmen. Under accidents caused by electricity. the chart shows 165 injuries, 30 deaths, and a loss of 192,634 working days; while under illuminating gas there are listed 8 injuries, 1 death, and a loss of 6109 working days. In addition, asphyxiation (though there is nothing to indicate whether by gas, smoke, or other causes) was responsible for 16 injuries, 8 deaths, and a loss of 40,144 working days.

Flueless Heating Stoves in Workshops.—In their "Bulletin" for October the British Commercial Gas Association say they understand that in some districts an attempt is being made by the Home Office Factory Inspector to oust all flueless heating-stoves from factories and workshops, and to persuade factory managers not to adopt, and gas managers to decline to supply, this method of heating—regardless of its suitability, freedom from objection, and legality in the majority of instances. They add: "This line of action, if acquiesced in by gas managers in some districts, is likely to be more widely adopted by the factory inspectors, who for want of accurate information in some cases, and in other cases because flueless stoves are sometimes installed by consumers in unsuitable conditions, are generally prejudiced against this method of heating. As this would be very detrimental both to factory owners (who would have to adopt more expensive and less convenient methods of heating at large costs for installation) and to the gas industry, and as there is no justification for such action, it has been thought well to reprint from the 'Bulletin' of January, 1915, an article then published setting out the merits of the case and the line of action to be followed by any manager faced with the problem in his district. It is hoped that managers generally will contest the action of local inspectors in all cases where the facts warrant their so doing, and will, on the other hand, do everything possible to discourage the use of flueless stoves in unsuitable conditions."

SOCIETY OF BRITISH GAS INDUSTRIES.

Autumn General Meeting.

ON Thursday last, the autumn general meeting of the Society took place at the Trocadero Restaurant, Piccadilly Circus, W. The gathering was presided over by Mr. ARCHIBALD P. MAIN (the Chairman of the Council), who gave an account of the past half-year's activities, and thereafter read a paper. After business, the members had tea together.

Before the agenda was proceeded with, it was explained by the Chairman that the Right Hon. Lord Moulton, K.C.B., G.B.E., F.R.S. (the President), and Sir Robert Hadfield, Bart. (Past-President) were absent; but they had with them Sir Arthur Duckham, K.C.B. He pointed out that at the present time public men—especially one in the position of Lord Moulton—were overwhelmed by the amount of work they had to do in the interests of the nation. This was the explanation of Lord Moulton's absence, as it also was of that of another distinguished gentleman, the Right Hon. Lord Haldane, F.R.S., who, apart from anything else, was interested in their work because he was Chairman of the important Coal Conservation Committee.

The SECRETARY (Mr. Arthur L. Griffith) next announced the receipt of other letters of apology for absence—from, among others, Lieutenant-General Sir Alfred Keogh, G.C.B., G.C.V.O., Col. Arthur Smithells, C.M.G., Sir Dugald Clerk, D.Sc., K.B.E., F.R.S., Mr. J. H. Balfour Browne, K.C., and Prof. Harold B. Dixon, C.B.E., F.R.S.

THE WORK OF THE HALF YEAR.

The CHAIRMAN then rose to report to the members on the Society's work during the past half year; prefacing his remarks on this subject by reference to honours conferred upon some of their distinguished members—Sir Alfred Keogh, Sir Henry E. Duke (now a Lord Justice of Appeal), Colonel Arthur Smithells, C.M.G., Prof. Harold B. Dixon, C.B.E., Sir Arthur Duckham (appointed Superintendent of Air-Craft Production), Mr. John West (who had been awarded the "Birmingham" Medal of the Institution of Gas Engineers), Mr. Fred J. West (who was Chairman of an important combination of employers in Manchester), Sir T. H. Spencer, K.B.E., and Mr. W. J. Jones, C.B.E.

With regard to the six months' work, he said, they had been represented on a Committee of the Institution of Gas Engineers who were dealing with the very important matter of preparing a statement for presentation to both Houses of Parliament on the conservation of coal from the gas companies' point of view. This was a matter of the utmost importance, in view of the fact that the electrical people had forestalled them, and some time ago presented to Parliament their report on the same subject, in which they emphasized the services of electricity in connection with the conservation of coal. They had also been represented on one of the Committees of the Federation of British Industries established in connection with the Bill which the gas companies promoted for their relief under the sliding-scale. As they were aware, Sir Robert Hadfield, who had just left them, had offered some valuable prizes for competition; and they wished to urge upon the members the importance of bringing the scheme to the notice of their employees, and making it a real success. At the express wish of Sir Robert, the Society gave the recent British Scientific Products Exhibition their support. Those of them who had visited the exhibition would be aware that it was an undoubtedly interesting one—especially as demonstrating the immense number of articles manufactured before the war in enemy countries which were now made by British firms.

In the Meter Section, they had had important conferences dealing with the life of gas-meters, the guaranteeing of meters, the rating of meters, and unaccounted-for gas. Evidence had been given by them before the Gas Traction Committee; and important services had been rendered in connection with the rationing of materials.

In the Lighting Section, they had also dealt with the rationing of materials; while in the Fire-Clay Section—one of those industries in which Germany before the war was supposed to be pre-eminent—they had made a grant of £150 towards the expenses of the refractory materials research. This had been highly appreciated. They had dealt, too, with the investigations into the manufacture of retorts by casting processes.

Coming to the Gas-Stove Section, they had during the past year been in close association with the National Kitchens Division, and had materially assisted in the provision of special gas apparatus for the requirements of the various kitchens and restaurants which had been established throughout the country. The members comprising this section had shown a splendid spirit of co-operation, and had undoubtedly assisted materially to bring about the success of this movement. Nearly a thousand kitchens of various kinds had been equipped, and generally speaking were being carried on successfully. It was gratifying to note that the majority of kitchens erected were provided with gas apparatus. With regard to the release of metal for burner and gas-fitting production, acting upon the advice of the Society a further large quantity of metal had been allocated to the various manufacturers in Great Britain; and arrangements were at the moment being made to release a further quantity to cover manufacturers' requirements to the end of the year. The action of the Society had been much appreciated by manufacturers throughout the country, and had enabled them to supply gas undertakings, both at home and in the Colonies, with the necessary materials for lighting of which they were badly in need.

RECONSTITUTION OF THE NATIONAL GAS COUNCIL.

There remained, the Chairman went on to say, the very important question which had lately been sprung upon them, of the reconstruction of the National Gas Council. The Council of the Society had given this matter very serious consideration indeed. It was quite needless for him to say that the proposed reconstruction involved questions of the greatest concern to all of them. That morning their Council had discussed the matter fully; and as the result of this discussion, they had sent the following letter to Mr. Milne Watson.

> The Council of the Society of British Gas Industries have had under consideration the proposed reconstruction of the National Gas Council; and they decided that, until they have had an opportunity of placing the matter before the whole of the members of the Society, they cannot agree to the new scheme whereby the Society of British Gas Industries is excluded.
>
> The general feeling of the Council is that a National Gas Council which does not include the whole of the gas industry cannot be a truly representative body, which, in their opinion, is most desirable.

A RESOLUTION ADOPTED.

Mr. FRED. J. WEST then opened an informal (but private) discussion on the subject which the Chairman had last touched upon; and he proposed the following resolution, which was carried unanimously.

> That the Society of British Gas Industries strongly supports the formation of a National Gas Council on a reconstituted basis, but considers that provision should be made by the National Gas Council under which the Society is admitted on terms of equality, with representation on the Executive Council.
>
> It is only on these conditions the Society can consent to support the reconstituted body.

WASTE AND CONSERVATION OF CAPITAL.

The CHAIRMAN then read a paper on "Capital: Its Waste and Its Conservation," which was followed by a good discussion. Pressure this week on the limited space available under war conditions compels the holding over of any notice of the paper and of the remarks to which it gave rise.

THE NEW PRESIDENT.

The CHAIRMAN intimated that their old friend Sir Arthur Duckham had accepted nomination as President of the Society for the ensuing year. He was known to all of them. The Government had secured his services, first in one position, and later on in the extremely important Air-Craft Production Department. They were highly fortunate, when looking for a successor to Lord Moulton, in being able to secure the services of Sir Arthur Duckham; and they heartily welcomed him. [Applause.]

SIR ARTHUR DUCKHAM remarked that it was the greatest compliment that had been paid to him in his life for them to ask him to become their President. It would be a compliment as an outsider; but it was doubly a compliment as an insider—though perhaps not an active one at the present time. He could now see possibilities of being able in the coming year to devote time to the Society of British Gas Industries. This would be a great happiness. He had been giving himself up entirely to the work of the Government, having been a volunteer since the start; and all through he had felt that it was the previous training he had had, both as a gas engineer and as a commercial man, which had made it possible for him in some way to fulfil the very arduous duties that had been placed upon his shoulders. He looked forward to a year of great activity, and trusted he might be able to be of some assistance to the Society, with which his whole future was more or less bound up.

THE INSTITUTION OF GAS ENGINEERS.

PROCEEDINGS AT THE SPECIAL GENERAL MEETING,

HELD AT

THE INSTITUTION OF CIVIL ENGINEERS, LONDON,

OCTOBER 17 and 18, 1918.

President: Mr. SAMUEL GLOVER, M.Inst.C.E.

REVIEW OF THE PROCEEDINGS.

[The discussion as to representation of the Institution on the proposed reconstituted National Gas Council and the general proceedings are reported in full in this issue. The various reports submitted will, with the discussions upon them, appear in our pages in succeeding issues until publication *in extenso* is completed.]

THE Special General Meeting of the Institution, which was held last week, declares forcibly, by numbers, interest, and every other means of applicable measurement, that, when there is anything of particular moment to the industry to talk about, the calling together of the members is a right and proper thing. And there is an abundance of matters upon which to confer at the present time—matters that could not all be pressed into these very full two days' sittings. But the matters that were discussed stand in the front line of those things that are urgently and materially important to the gas industry at this juncture. We are at a stage when momentous decisions have to be made; and in connection with such of the subjects as the members discussed last week, the voice of the technical man has to be heard, his views weighed, and respect must be paid to the verdict of the majority. At the first morning's sitting Lord Moulton graced the proceedings by his presence; and interest in the report of the Gas Investigation Committee brought to the meeting Sir George Beilby, the Director of the Fuel Research Board, and Sir Dugald Clerk. Their attendance gave pleasure to the members. The presence of Sir George Beilby especially was symptomatic of an interest in high places as to the fundamental change which developing knowledge and requirement are, with increasing insistence, calling for in the character of town gas, with the view to national and individual economy.

The Reconstitution of the National Gas Council.

This was the opening business to which the President directed attention. At first it looked as though there would not be anything notable transpire from it; but there was. The President pointed out that, so far as the Institution was concerned, the proposal was that it should be represented on the reconstituted Council by four members; and he asked the members to agree in this way to form part of the reconstituted Council. There was an omission at the beginning; no formally drafted resolution being put before the meeting. During the discussion this was called for, and granted. There were other members who rather objected to give their adherence to the proposal without proper indication as to the plans of reconstitution. To these publicity has been given in the columns of the "JOURNAL." There were others who were in disagreement with certain details of the new constitution—such as those regarding voting powers; but all such details the President said were matters that must be left to the representatives of the Institution to be discussed and dealt with at the meeting that afternoon of the National Gas Council. One thing certain of the members overlooked; and it is that it is the National Gas Council that is reconstituting itself, and that the Institution in its representation upon the existing Council is only one part of it. The Institution therefore cannot order; but it has a right to secure a fair share of representation in its corporate capacity, and that share must have relation to the share of other bodies. Some seemed to think that four members for the Institution on the Executive Board would be too small; but it must not be forgotten that, through the section of the scheme which provides for all parts of the United Kingdom being represented by District Committees of the undertakings who will send from their own areas representatives to the Council, gas engineers will in all probability be the accredited representatives in a fairly considerable majority. Certain it is that they will have a very fair share numerically and in influence in the decisions of the Council, acting under the instructions of their own district unions of undertakings. There were little thrusts, too, on the subject of a complete reorganization of the industry; but from other directions came indications of the opinion that the present scheme is a step which will pave the way to thorough organization. And it was Mr. J. P. Leather who reminded the members that such a technical organization as the Institution is not, and cannot be, representative of all the interests of the industry, nor has it authority to deal with them. Inquiry came from several quarters, and explanation was given by the President and others on his side of the table. The full report elsewhere will supply the detail.

Labour Questions and the Reformed Council.

But the pivot of interest was the attitude of Mr. Charles Carpenter, D.Sc. He raised no objection whatever to the proposed reconstitution. As a matter of fact, if one could get into touch with what he has in mind, it may be imagined it would be found that, in his opinion, the present Council very much needs reformation; and any scheme of improvement would be better than the existing constitution. But the point that he required enlightenment upon was as to the extent that the Institution or gas undertakings would be bound in respect of labour problems by joining the reconstituted National Gas Council. This is an important point for adequate consideration. The proposal in the reconstitution is that an Employers' Committee should be formed to deal with labour matters, but that only those undertakings that are members of the Committee would be bound by their decisions, and not the undertakings as a whole associated with the National Gas Council. Mr. Carpenter would prefer an absolutely independent organization to be established for dealing with labour questions, the same as is now the case in the chemical industry, in which, as he explained, there is the Chemical Manufacturers' Association, with an entirely detached Federation of Employers to handle labour questions. There seems to be a difference without any great distinction between what is proposed by Mr. Carpenter and what is contemplated by the National Gas Council; and a point upon which there should be satisfaction is as to whether it is not in the general interest better for an Employers' Committee to be working with a connecting link with the national body than to be an altogether separate organization, in view of the way that things have developed in the labour world, and the part the Government are now taking in connection with labour. Whatever the body—whether attached or detached—its decisions are likely to have universal application. Consider that point, and act afterwards according to decision. However, it will be seen from the report that Mr. Carpenter has very definite opinions on the subject; and he appeals to his experience of actualities in connection with labour. It will be seen that he has small liking for the weak-spirited methods that have been adopted by certain Government officials in dealing with labour, and that his deeply rooted conviction is, as it is ours, that co-partnership is a more potent ruling force than trade unionism.

A resolution was proposed by Mr. Herbert Lees and seconded by Mr. A. E. Broadberry, approving of the scheme. To meet his point, Mr. Carpenter finally proposed the addition to the resolution of the words: "Provided that a separate organization be formed for dealing with labour questions." This was accepted by the mover and seconder of the original resolution, and in this form was carried *nem. con.* The full import of the proviso was apparently not in the minds of the members. But this is a matter dealt with in our editorial columns.

Report of the Research Sub-Committee on Effects of Gas Composition.

The long looked-for report of the Research Sub-Committee appointed by the Gas Investigation Committee of the Institution next claimed consideration by the members. The Sub-Committee has in its constitution representatives of the Leeds University and the Institution; Professor Arthur Smithells, F.R.S., being the Chairman. The research work has been carried out by Mr. James W. Wood, M.Sc., under the supervision of Prof. J. W. Cobb. The report is a voluminous and valuable one. Details, tabulated statements, and conclusions will appeal to industrious students; but the quantity of it all will repel less diligent men. The purpose of the appointment of the Sub-Committee was to investigate the relative efficiency in use of different grades and compositions of gas; and thanks to the generosity of the Birmingham Corporation Gas Department, and the kindly help of Mr. E. W. Smith, D.Sc., the Chief Chemist of the Department, and a member of the Sub-Committee, the investigations have been carried on in the Nechells laboratory, and with the experimental plant there under conditions which start the investigation at the proper place—that is, with the gases available to-day. The reference to the Sub-Committee is not to find the comparative economies of producing gases plain or mixed; but only to ascertain their relative efficiencies, within the limits allowed by existing appliances. The conclusions, of course, are strictly confined by this fact. Extensive as has been the work done, the ground is not yet completely covered. Only the ring burner for boiling purposes, the upright incandescent burner for illumination, and the gas-fire (partially) have been taken. But the report to our mind indicates conclusively that the first steps in advance in producing a more economical gas will have to be made from the point of view of existing consuming appliances, the varied character of which makes the problem somewhat intricate. For example, for boiling purposes almost any mixture of gas within reason of low calorific power could be adopted; but not conveniently for incandescent lighting and existing gas-fires. A greater range of facility in economical gas production will probably be made available as existing appliances can be converted to better regulation, and in the case of upright burners (the value of this part of the investigation awaits enhancing until completed by utilizing the inverted burner) and the radiants of gas-fires be made more suitable (say) to gas of considerably different composition from that now supplied.

Mixed Gases of Many Kinds.

In preparing the notes for a review of this first report, an attempt was made to summarize the details of the enormous number of tests carried out; but it was found that such a review would become so extensive in itself that it would be better to leave the details in the original form as presented and as will be published in the "JOURNAL" from week to week as space, under the inflexible rule of paper restrictions due to shortage, will permit. The first tests made were with a ring burner, using a copper kettle containing 8 lbs. of water. As one proceeds with the investigation of the results, there are almost overwhelming data derived from the numerous tests regarding consumptions, B.Th.U. supplied per hour, efficiencies, time, and height of kettle base above burners. The investigations were made with coal gas of 530 B.Th.U. gross (480 B.Th.U. net), and 18·7 p.ct. inerts; with gas of moderately low calorific value (411 B.Th.U. gross, or 367 B.Th.U. net) and high inerts (35·2 p.ct.); with coal gas *plus* blue water gas of 404 B.Th.U. gross (364 B.Th.U. net, with 26 p.ct. inerts); with coal gas *plus* air (453 B.Th.U. gross, 405 B.Th.U. net, with 35·5 p.ct. inerts); with coal gas *plus* air added to the gas in the holder (348 B.Th.U. gross, or 314 B.Th.U. net, with 51 p.ct. inerts), and with Mond gas slightly improved by the addition of a small amount of coal gas (241 B.Th.U. gross, or 214 B.Th.U. net, with 51·7 p.ct. inerts). The efficiency with the 480 B.Th.U. coal gas was on the net value 53·5 p.ct.; on the 367 net coal gas and high inerts, 56·2 p.ct; on the 364 net coal and blue water gas, 55·8 p.ct.; on the 405 coal gas and air, 53·5 p.ct.; on the 314 net coal gas and air added in holder, 54·6 p.ct.; and on the 214 B.Th.U. net Mond gas with a slight addition of coal gas, 54·7 p.ct. It will be observed how close the efficiencies are with different quality gases, despite mixtures, varying calorific power, and inerts.

Ring Burner Efficieney.

Of ring burners generally, it may be said that efficiency does not depend upon the time taken to raise temperature. Other than through poor aeration or too close proximity of the containing vessel, efficiency is almost independent of the rate at which the gas is burned between the limits of 10 to 25 c.ft. per hour for the particular burner experimented with. Flame contact is essential for high efficiency; but regard must be had to proper aeration of the flame, and ventilation of the burner. The distance between the bottom of the vessel and the surface of the burner requires special consideration in relation to the gas used, in order to secure the maximum efficiency. But, generally speaking, details of the tests show that a good working distance with almost all grades of gas is 1 in., except when the flames are shortened considerably by changing the character of the gas. With some of the mixed gases, there was a very objectionable odour when the kettle was placed too close to the burner. The report presents what are considered to be good working conditions.

Practically Independent of Composition, Inerts, or Calorific Value.

The report shows how fairly concordant the efficiencies are with all mixtures of gases tested for boiling purposes; and the results do not disclose any very marked differences due to the presence of inerts. Even in the test with Mond gas, improved by a slight addition of coal gas, with 51·7 p.ct. inerts, an efficiency was obtained on the net calorific value of 54·7 p.ct. It is clear that for boiling purposes the results realized from a particular gas depend on the number of heat units supplied; and provided suitable adjustments are made, the efficiency is practically independent of composition, inerts, calorific value, or rate of consumption per hour. As a matter of practical convenience, however, to deliver a sufficient number of B.Th.U. in a reasonable time without the use of abnormal pressures, the gas should be of moderately high calorific value. Presumably the conclusions depend upon the fact that the difference between the temperature of the water (even at its boiling-point) and that of the flames of any gas mixture which has been tried, is so great that the variations in flame temperature met with in practice are negligible in effect. The addition of air to the gas at the holder does not give better results than those obtained with a properly adjusted burner, working in the ordinary way; while the pressure, &c., required to deliver the same number of heat units and do the same heating are increased. The efficiency of ring burners properly adjusted and using the same gas varies considerably with the type of burner employed. When the gas quality is sufficiently reduced, lighting-back occurs with most ring burners in common use; but the limit varies considerably with the design of the burner. It varied from 500 B.Th.U. gross to 400 B.Th.U. gross in these experiments. It is clear that a wide variation in grade or composition of gas can be made with reference to other uses, without impairing the efficiency of the ring-burners now in use.

Upright Incandescent Burners and Gas Composition.

As before remarked, the lighting burner tests were only carried out with an upright burner, on the efficiency of which flame size and flame shape have an important bearing. There would therefore be no justification for applying the results obtained in the tests to inverted burners and mantles, in which the flame shape and distribution of the zone of active combustion are of a totally different order. The report intimates, however, that tests with inverted burners are now being conducted. The tests with the upright burner were made with coal gas of 615 B.Th.U. gross (552 net), containing 10·1 p.ct. total inerts; with coal gas of 525 B.Th.U. gross (472 net), containing 18·7 p.ct. inerts; with coal gas of 488 B.Th.U. gross (441 net), containing 26·4 p.ct. inerts; with semi-carburetted water gas of 446 B.Th.U. gross (409 net), and 24·6 p.ct. inerts; with coal gas and air of 373 B.Th.U. gross (335 net), and 43·8 p.ct. inerts; with coal gas of 368 B.Th.U. gross (330 net), and 38·8 p.ct. inerts; with coal gas and blue water gas of 365 B.Th.U. gross (330 net), and 20·2 p.ct. inerts; and with blue water gas of 314 B.Th.U. gross (285 net), and 19 p.ct. inerts. It will be seen from this list that the work here, as with the ring burners, has been very comprehensive; and, when we publish the report *in extenso*, it will also be remarked (from Table XVII.) what an important influence pressure has on the illumination derived by the consumer with burners now in use.

We will not refer to the mass of data and information given in this section of the report; but there are some important deductions to be drawn from the results of the work. In the first place, it is necessary for satisfactory lighting with incandescent mantles to place the mantle exactly in the zone of active combustion of the gas mixture. Or, since the burner and mantle are in practice fixed, the zone of active combustion must be made to fit the mantle. The above requirement is so stringent that, with all gases which could be proposed as reasonably suitable for public supply, other considerations—such as that of flame temperature—become relatively unimportant. The means of varying the position and the character of the zone of active combustion are by varying the gas consumption, or the degree of aëration. With gases of about 450 B.Th.U. gross and below, the control that it was possible to obtain by varying the consumption and aëration was not, the investigators found, sufficient to give satisfactory illumination. With the burner used, a gas of about 550 B.Th.U. gross maximum to 500 B.Th.U. gross minimum gave the best performance, both as regards efficiency and total illumination; but gases of about 600 B.Th.U. gross gave very inferior results, owing to defective aëration. Gases of low calorific value and high inerts were found

to be distinctly inferior, on all grounds, to gases of similar low calorific value but low inerts—*i.e.*, consisting mainly of low-grade combustible matter. The effects of inerts up to 20 to 25 p.ct. were less marked with gases of calorific value 500 to 550 gross; being, in fact, practically negligible. The maximum attainable illumination was found at about 525 B.Th.U. gross. When a reduction in illuminating power and efficiency accompanies a reduction in calorific value or an increase in inert constituents, the result is due immediately to unsatisfactory size and shape of the flame and its position with respect to the mantle. A gas in which the inerts are largely in the form of air does not behave as poor gas, but only as an equivalent volume of the original air-free gas.

Different Gases and Gas-Fires.

The investigation with gas-fires is not altogether satisfactory. It is incomplete; and the first used fire does not appear to have been the best suited for such a research, in view of the fact that it is not the gas-fire itself which has to be tested, but the efficiency of different gases. Therefore the fire employed should have been the best obtainable for the work—one with a good range of flexibility. But it was not so. The radiant heat is taken as the basis of comparison; no attention being paid to convection and conduction. This point must be borne in mind by those who—not of the gas industry—criticize the performances of gas-fires. Due to the indifferent character of one of the fires, we get with a coal gas of 559 B.Th.U. gross (503 net), and 17·5 inerts, a radiant efficiency of only 32·5 p.ct. on gross calorific value. With another coal gas of 499 B.Th.U. gross (452 net) and 23 p.ct. of inerts, a radiant efficiency was obtained of 29 p.ct. to 40·1 p.ct. on gross calorific value. With semi-carburetted water gas of 526 B.Th.U. gross (486 net), and 19·3 p.ct. of inerts, a radiant efficiency of 40·6 p.ct. on the gross calorific value was realized. The aeration of this fire was faulty—its capacity for delivering the B.Th.U. required with moderate pressures being too limited, and the radiants were of an unsuitable character. The fire was changed for one with a different type of injector and air control. With this fire, in a test with a straight coal gas of about 530 B.Th.U. gross, a radiant efficiency of 41·8 to 43 p.ct. on the gross calorific value was obtained; while a coal gas diluted with Mond gas of a calorific value of 385 B.Th.U. gross (347 net), and containing 36·8 p.ct. of inerts, showed a radiant efficiency on the gross calorific value of from 41·4 to 44·2 p.ct.

Among the lessons to be drawn from the report is that with the probable change in gas composition to effect manufacturing economy, makers of gas-fires will have to see that their fires give a good range of adjustment, and that the radiants are of a character suitable to the gas-flames which the altered gas will provide. Reverting to the test with coal gas diluted with Mond gas, it will be remarked that, in spite of the low calorific value and high inerts, the percentage radiant efficiency is practically the same as obtained from the richer gases previously tested. Sundry tests have been made in which the calorific value of a good coal gas has been reduced by the addition of considerable quantities of air. There is not yet sufficient evidence for the expression of a critical opinion; but it can be said without hesitation that the results are not markedly superior to those obtained from a thermally equivalent volume of gas burned in the ordinary way. In some tests the results are inferior; but this can be traced to the fact that the flames suffer from over-aëration—combustion taking place before the flames come into proper contact with the radiants.

As previously stated, the investigation of the efficiency of gas-fires is not complete, and the work is still in progress. Summarizing the results so far obtained, it may be said: With each gas-fire, there is a certain consumption which, for the gas used, gives the maximum radiant efficiency. If a fire is turned down so that less than half the radiants are heated, the efficiency suffers severely. Existing gas-fires vary very considerably in their ability to adapt themselves to gases of different grades. The evidence obtained so far points to the conclusion that a difference in the grade or composition of the gas supplied, within wide limits, does not cause any considerable difference in the radiant efficiency of a gas-fire, provided that the mechanical construction of the fire will allow sufficient gas to be passed, in order that the number of B.Th.U. per hour can be supplied to the radiants.

Preliminary to Criticism.

There were various appeals preceding and during the discussion asking the members to note that the report is merely a preliminary one, and that there is much work still to be done. News travels fast; and it was well known before the discussion took place that there would be a good deal of criticism, and so it turned out. Prof. Arthur Smithells, as Chairman of the Committee, himself indicated that he was under some apprehension when he saw the results; but all he asked for them was fair play. As he pointed out, it would be the easiest thing in the world to make wrong use of the results; and we are very much afraid they will be made use of by competitors to the detriment of the gas industry, even though reminded that the tests have not been made with appliances best suited to the gases tested. Especially is this so in connection with the use of the upright incandescent burner and gas-fires defective in respect of regulation and of suitable radiants. This, too, at a time when never so much as before the industry (as Prof. Smithells said) requires to be well advised as to the wisest course to pursue. All criticism notwithstanding, if the poor efficiencies of the appliances themselves are taken into account, value will be found in the report in respect of the disclosure it makes as to the efficiency of coal gas and mixtures of various grades under anything but favourable conditions. We are promised a continuation of the research with appliances more in accord with modern wont and use. It is hoped that this work will be hurried on, consistent with thorough investigation; for as Prof. Cobb remarked, in introducing the report, the Government now recognizes that the thermal and chemical value of coal should be preserved; and the gas industry has to make up its mind so as to be in a position to submit definite statements as to the quality of coal gas which best combines economy in manufacture and efficiency in utilization. Prof. Cobb followed Prof. Smithells; and Mr. Wood (the Research Chemist) summarized the report.

Some Impressions from the Discussion.

The discussion was opened by Sir Dugald Clerk, who with characteristic skill pointed the lessons of the report, and gave some sound advice as to what gas men should strive for. If there had been no other contributor to the discussion (as our verbatim report will show when published), Sir Dugald's remarks would have had compensatory weight and influence. The same may be said of Lord Moulton's comments; and the observations of Sir George Beilby, in view of his position in connection with the Board of Fuel Research, indicate the value that he places upon the research. The general discussion was so extensive that nothing more than a few impressions of it can be given here. Prominent among convictions is that we are now well on the road to a lower grade gas in respect of calorific power. Sir Dugald Clerk has his eyes on a gas of about 420 B.Th.U., if gas nipples can be got right for it. Mr. George Helps gave information as to what he is doing in supplying a lower calorific power gas, regarding which some speakers thought less generalities and more definite particulars would have been an advantage. The gas he is supplying is of 350 B.Th.U. net.; and there are no complaints. Mr. Tim. Duxbury has been supplying 400 B.Th.U. gas; and his consumers were not aware of the fact. Mr. W. M. Valon, Mr. W. A. Tookey, and others have been to Nuneaton; and the two gentlemen named vouched for the fact that the gas was to all appearances doing everything that Mr. Helps claims. But Mr. E. W. Smith, D.Sc., had something to say that was not altogether so favourable. What is the reason for the evidence that the 350 or the 400 B.Th.U. gas is doing as well as the 500? Mr. Helps lays it down as a theoretical formula worthy of acceptance that one B.Th.U. is as good as another. Mr. Stephen Lacey, Mr. Thomas Glover, and Mr. S. B. Langlands show that this requires some qualification. B.Th.U. are self-respecting things; and they will not perform their maximum duty if they are improperly treated. It depends on how the B.Th.U. are served up and utilized. In the tests in the report, as Mr. Helps and Dr. Davidson showed, if the appliances used in consuming the gas had been of better character, higher efficiencies would have been developed. The testimony seems to indicate—and this is a point for the manufacturers—that many of the appliances hitherto in use are not so capable of putting even 500 B.Th.U. gas supplied to them to the best use, and are better capable of giving the consumer equal service with a gas of lower calorific value. Another point that struck the members was the equality of efficiency with the different appliances with ranges of gas of widely varying composition and thermal value; as well as the fact that in the boiling experiments heavy inert contents did not affect the efficiency on the thermal basis. But speaking of motive power, Sir Dugald Clerk pointed out that he was not prepared to pay for any unnecessary nitrogen, carbon dioxide, and oxygen. He can get plenty of these gases from the air. All he desires to pay for are B.Th.U. He therefore urged gas engineers to get more B.Th.U. into their pipes from the coal they used; and Mr. Helps assured the meeting that it is within the power of every gas engineer to put 70 to 80 p.ct. of the B.Th.U. of the coal into their pipes, without seriously affecting the tar oils. But, on the other hand, we must proceed with discretion, and find out what, as Lord Moulton says, can be profitably taken out of the gas before using it for heating purposes. A balance of advantage has to be struck; and this is where investigations to come in respect of manufacturing economy will assist decision. For this part of the research, the Uddingston Gas-Works, with their continuous vertical retorts, have been generously placed at the disposal of the Committee; and the Research Sub-Committee have co-opted as a member Mr. Lawrence Hislop. The Council of the Institution have also authorized the appointment of a Research Chemist.

Reverting to the experiments as to the boiling of water, the efficiencies of about 50 p.ct. with widely varying gases led to Sir Dugald Clerk expressing the opinion that, if only the manufacturers of ring burners would devote themselves to the work of getting higher efficiencies, there is no reason why they should not get to 70 p.ct. There were hints as to a burner having already been devised which will give an efficiency of 60 to 65 p.c. with a gas of low calorific value. The efficiencies of the upright burner used in the tests come in for heavy criticism; it being easy under ordinary circumstances to get 18 candles per cubic foot with upright burners and 25 candles with inverted ones. In this connection Mr. J. W. Brearley objected to 525 B.Th.U. gas being, at this stage of the investigation, designated as the best for incandescent burners.

There was warning, too, not to make too loose reference to flame temperatures. The highest possible flame temperature is required at the part of the flame which incandesces the mantle; but it is necessary that the mantle should fit the flame. Allied to this is the claim of Mr. Helps to flame structure and flame content; but reminder was given of the reference by Mr. A. Forshaw to the importance of flame structure years ago in a paper read before the Institution. The efficiencies shown by gas-fires, it was also pointed out, were not comprehensive; as they do not take any account of the useful heat given by convection and conduction, and the radiant efficiency ascribed is deficient through the defects of the fires themselves.

Consumers' Meters and War-Time Troubles.

The foregoing concluded Thursday's proceedings. On Friday morning, members had two communications through the Gas-Meters Research Committee—the first being by Mr. J. G. Taplay, the Chief Analyst to the Gas Light and Coke Company, and the second by Mr. B. R. Parkinson on "Unaccounted-for Gas." The two papers have an extraordinary practical value in connection with the troubles that have been experienced with meters, and the part that consumers' meters take in contributing to the building-up of an uncomfortable percentage of unaccounted-for gas—particularly during war time. Both contributors to the proceedings have done eminently good work for the industry—not only in connection with discovery, but in showing one means by which the life of meters may be prolonged in these days when oil is scarce and hydrocarbons are removed from the gas for war purposes. Causes, effects, and cure are found in the communications.

Mr. Taplay on Meter Corrosion and Oil-Spraying.

The investigation described by Mr. Taplay, on the "Corrosion of Gas-Meters," may be put under four headings: (1) The determination of the bodies condensed in dry gas-meters. (2) The identification of the bodies causing corrosion of the metal parts, destruction of the leathers, and the sticking of the valve. (3) The production of the corrosive bodies. (4) The remedy. Mr. Taplay has not had time to examine a large number of liquors and corrosion deposits obtained from dry meters. Consequently the report may be far from complete; but some of his typical examples can be given.

Taking first the determination of the bodies condensed in dry gas-meters. The deposit from meter No. 172,781 consisted of three parts: An oily part, an aqueous part, and a solid part. The oily part consisted of some liquid and soluble solid hydrocarbons condensed from the gas, and may be considered as non-injurious to meter leathers, because no leather substance was found in it. The aqueous part consisted of a mixture of the bases of the pyridine group, ferrous and ferric sulphates, ferric thiocyanate, ammonium thiocyanate, ammonium thiosulphate, and on evaporation of the liquid there remained, in addition to the above constituents, a solid residue of leather substance. The solid part consisted of leather substance equivalent to 91 p.ct. by weight; oxide of iron sulphate of iron, sulphate of tin, and sulphate of zinc, together, equal to 8·5 p.ct. by weight; and sulphur equal to 0·5 p.ct. by weight. Regarding meter No. 10,519, the deposit consisted of a mixture of oxide of iron, sulphur, and ammonium sulphate. In the case of meter No. 115,561, the deposit consisted of a mixture of oxide of iron, oxide of copper, sulphur, much ammonium sulphate, and much copper sulphate. In meter No. 713,247, the deposit consisted of a mixture of oxide of iron, sulphur, ammonium sulphate, and a little ammonium thiosulphate.

Passing on to the next part of the investigation—viz., the identification of bodies causing corrosion of the metal parts, destruction of the leathers, and the sticking of the valve. First as to the corrosion of the metal parts, the experiments made prove that both tinned sheet iron and brass were attacked by aqueous solutions of ammonium thiocyanate, ammonium sulphate, and ammonium thiosulphate, with liberation of ammonia. In the case of brass, the corrosion is very rapid. Ammonia itself is without action on the above metals. Next as to the destruction of the leathers, ammonia will at once remove the oil dressing, and the tannin from the leather, but will not dissolve the latter. The leather shrinks and hardens. Aqueous solutions of ammonium thiocyanate, sulphate and thiosulphate, bases of the pyridine group and ferric thiocyanate remove the oil dressing from the leather; and after the removal of the oil dressing, the solutions of ammonium thiocyanate, pyridine bases, and ferric thiocyanate all contained leather substance—the last compound the greatest quantity. Solutions of all the above bodies, except ammonium sulphate, contained tannin, oxide of iron, and lime derived from the leather.

Before proceeding, a few words may be said on moist sulphur dioxide. This impurity is always present in blue water gas, and is produced by oxidation of the sulphur contained in the coke. If allowed to pass into the purifiers for any length of time unchecked, it will upset their proper working, and may appear on the district, and if, by any chance, it arrives at the meter, it will damage both the metal parts and the leather. However, by using a little oil for carburetting purposes or by passing a little ammonia with the blue gas into the purifier, the sulphur dioxide is eliminated. Concerning the sticking of the valve, Mr. Taplay points out that the substance which causes valve stoppage is a gummy compound of the nature of resin, and is produced by the oxidation of a constituent of the tarry and oily condensates from the gas.

Next as to the production of the corrosive bodies, this is partly due to the reaction of carbon bisulphide with ammonia, both of which are constituents of coal gas. The interaction of these two bodies has been more energetic since the removal of benzol from the gas for war purposes. Therefore it would seem to be the proper thing to keep the meter "wet" with some kind of liquid hydrocarbon to take the place of benzol, and other bodies in small amount, removed from the gas. The removal of the benzol has produced more corrosion in dry meters than existed in pre-war days. It becomes therefore necessary to find a remedy for the present state of things.

As to the remedy, although some dry gas-meters were found by Mr. Taplay to be badly corroded, others from another district were found to be very well preserved, both as regards the metal parts and the leathers. The meters in this latter district had been subjected to the paraffin fog, produced by the Botley plant in use on the district for several years; and their interiors were found to be well oiled with the paraffin oil. Mr. Taplay therefore suggested that all meters, both new and repaired, should be sprayed with paraffin distillate; and after some consideration, he chose solar distillate—a gas-making oil—for the purpose. Both slow and stopped meters have been sprayed with cold solar distillate, and good results obtained; the meters being again put into action. The oil is atomized, and finds its way to all parts of the meter accessible to the gas. It does not require much oil to produce the result; and the excess oil can be drained away from the meter. In this way the surfaces of the metal parts are thoroughly oiled, and this prevents access of any corrosive liquids to these parts, although such liquids might collect in the meters. Mr. Taplay, in conclusion, urges that on no account should dehydrated water-gas tar-oil be used for spraying dry meters on account of its cheapness compared with solar distillate, as the former contains large quantities of resin-like substances; and the use of such an oil would cause the last state of the meter to be worse than the first.

Mr. Parkinson on the Association of Oil Use and Unaccounted-for Gas.

Mr. Parkinson gave a *résumé* of his paper in the form of a lecture, illustrated by lantern slides. Of the 7 p.ct. of unaccounted-for gas which the Gas Light and Coke Company showed in their published figures for several years, Mr. Parkinson ascribed 1 p.ct. to actual leakage and about ¾ p.ct. to differences in volume due to temperature, pressure, and condensation. These figures agree substantially with the conclusions of Mr. Stephen Lacey, the Distributing Engineer to the Company, whose article on the subject appeared in our last issue; indeed they are based upon his premises. The leakage theory was supported by diagrams, which show that fluctuations in the unaccounted-for gas are not paralleled by any similar fluctuations in the Mains Department returns of escapes. On the contrary, when the escapes are more numerous, the unaccounted-for gas is down. The value of such statistical evidence lies in the vast scale upon which the operations of the Company are conducted. The investigation then proceeded in regard to the balance of about 5 p.ct. which appeared to be due to the defective registration of meters. In 1915, the figure of unaccounted-for gas dropped mysteriously from 7 to 5½ p.ct.; and Mr. Parkinson related his endeavours to find out what happened in that year to make the difference. This led to the discovery of the influence of oil gas on the working of meters; and a chart was thrown upon the screen showing a remarkable symmetry in fluctuations between the quantity of oil used (in million gallons) and the unaccounted-for gas—the movement of the lines appearing in contrary directions. Another chart showed that the behaviour of meters tested was better in 1915, and incidentally that the results have been growing worse since that date. Some further diagrams were shown giving the fluctuations in the ammonia content; and the conclusion was arrived at that in 1915, the great drop in the unaccounted-for gas was due positively to the beneficial effect of an abnormal use of oil gas, and negatively to the absence of ammonia on the district. Further evidence was supplied by a plan of the whole area of the Company divided into districts each of which was marked with the percentage of "stopped" meters that occurred during last year. This led to the discovery that in a district where the paraffin vaporizer for naphthalene prevention had been longest in operation, the meters were found to be in the best condition. But this did not imply that naphthalene itself was the cause of meter deterioration. For the actual causes due to compounds of ammonia and carbon bisulphide reference was made to the paper of Mr. Taplay. All conclusions point to the necessity of lubricating meters—especially at the present time, when gas is stripped of its oily constituents; and the lecture concluded with a demonstration of the process of spraying dry meters with an oil fog. The apparatus for this consists of a pump and receiver giving a pressure of 35 lbs.; and a spraying pistol similar to that used for painting. The nozzle is passed into the inlet; and the meter is worked by the spray to the extent of a few feet. The effect is to clean the valves and soften the leathers, and generally to restore the meter to normal working. Thus is this interesting investigation brought to a practical conclusion.

Lubricating Meters from the Works or Individual Spraying.

There was general agreement in the discussion as to the value of the two contributions, in assisting to an explanation of the rise in the unaccounted-for gas. But there seemed to be some difference of opinion as to whether the greater effect on the working of meters was not due to the removal of benzol and toluol from the gas than to the enforced reduction or absence of carburetted water gas. Among those who incline to the view that the abstraction of benzol and toluol may have the greater effect is Mr. T. S. Lacey; and Mr. Alex. Wilson confirms this when he states that at Glasgow, without carburetted water gas, they have been experiencing increased troubles with meters. In fact, he says, the troubles have increased alarmingly. There was also a division of opinion as to the best means of oil-treating the meters—whether from the works or individually. Mr. F. G. Cockey, the Chairman of the Meter Section of the Society of British Gas Industries, inclines to the view that the cheapest way would be to put oil into the gas periodically for a few hours during the time of maximum consumption; and so in this way the meters would get lubricated. Spraying *in situ*, in his opinion, can only take place at long intervals. Some doubt was also in the mind of Dr. Lessing as to whether carburetted water gas would be more effective than oil spraying the meters; seeing that in the former the oil is not carried forward as oil. Mr. Cockey was also dubious as to carburetted water gas being a cure for the troubles with dry meters. Mr. Lacey was afraid the oil put in at the works would not carry sufficienly long distances to do the same amount of good as oil spraying the meters. The authors adhered to their point that the superior method was by oil spraying the meter mechanism. Mr. A. E. Broadberry has tried the oil-spraying remedy, and fully confirms its efficacy. Beneficial, too, has Mr. Wilson found putting paraffin into meters by the aid of an air blast. Mr. R. Halkett has discovered, in these days of expensive diaphragms, that a mixture of olive or almond oil with blacklead is a friendly agent; and the blacklead protects the oil from absorption by the gas. Asked how he would put the oil-spraying system into practice, Mr. Parkinson said his idea is the use of a motor van carrying a pump or compressor. Meters could be disconnected, taken into the van, sprayed, and then refixed. The oil is put in at a pressure of 35 lbs. Mr. Parkinson raised a laugh, at Mr. Goodenough's expense. This gentleman, he said, is rather nervous as to what his consumers would think if anything of the kind were done; and so he (Mr. Parkinson) supposes if the 800,000 meters on the district of the Gas Light and Coke Company are treated, it would have to be done while Mr. Goodenough was away on his holidays.

Passing Forward Increased Ammonia.

Two reports of such a character as those of Mr. Taplay and Mr. Parkinson would naturally give scope for speaking on many points, as they raised matters that were novel to many of the members. From among the points, there may be mentioned further the pleasure Dr. Lessing found in learning that Mr. Taplay had established the reputation of his (Dr. Lessing's) analyses as to the interaction of carbon bisulphide and ammonia. Mr. Broadberry related how in 1915 there was at Tottenham an increase in the oil used; but he found the ammonia counteracting the good effects of the increase in oil, and the increase in oil was not able to stop the bad effects of the increase in ammonia. It was suggested by Mr. Robinson, of Harrogate, that the hardness of the water used for washing the gas might account for the passing forward of a high amount of ammonia. With soft water at his present works, he gets the ammonia down to ½ grain. In the case of the Gas Light and Coke Company, Mr. Taplay mentioned that the higher quantity of ammonia in their case was due to the greater transfer of washers to oil washing.

Unaccounted-for Gas.

There were a few references to this subject. Some surprise was expressed that (as Mr. Stephen Lacey also showed in his article in the "JOURNAL" last week) so great a proportion of unaccounted-for gas had been tracked back to defective meter registration; and the 1 p.ct. of leakage from the mains of the Gas Light and Coke Company was described as "very creditable, but very exceptional." The conditions of London streets have, of course, a character that is not usual. Speakers confessed to a certainty that their leakage is higher. Mr. Alex. Wilson was one; and he also questioned Mr. Parkinson's point as to temperature conditions being cancelled-out by the distribution conditions, and therefore do not need correction at the station meter. It might be that in some cases no corrections require to be effected; but where the temperature of the meter is much above the normal, then corrections are necessary. An interesting little experience regarding wet meters and unaccounted-for gas came from Mr. R. E. Gibson, of Liverpool. To the form of meter used and the antiquated Sales of Gas Act, he attributed the high unaccounted-for gas. The distribution pressure being higher than that at which the meters are tested, the water gets blown out of the meter, and so there is a low water-line. The Company are now constructing meters which will not act in this way. A serious matter with the wet meter is that a low water-line is liable to close-off the gas, and then allow the gas to come on again.

The Coal Controller Pays a Visit.

While Mr. Parkinson was describing his charts, Sir Guy Calthrop, the Coal Controller, put in an appearance, having been invited by the President to address the members. Before he did so, however, the President read a telegram received from His Majesty the King, thanking the members for the loyal message which had been sent to him, as well as for their assurance that they would continue to do their utmost to work for success and victory in the war.

Although he did not look in the least perturbed, Sir Guy said it felt like walking into the lion's den to come there that day. This, of course, was only a little pleasantry on his part; for a man who has had to face such a mass of dissatisfaction at every turn as he has had to do—from colliery owners and miners and from the representatives of practically every one of our native industries, while being urged to do this or that by every Government Department—is not likely to be much put out by attending a meeting of men who can appreciate his difficulties, if they cannot see eye to eye with him in all his doings—particularly that part of them which concerns their industry. Sir Guy thanked the engineering officials of the industry for their help to him. He knows all about the 15,000 c.ft., and of the dissatisfaction regarding it. But in the Fuel-Rationing scheme, he has not satisfied anybody. He has, he asserted, tried to deal out justice as fairly as he could possibly do. He complimented the industry upon its criticisms and comments being always constructive and not destructive. But the most important announcement was that, though peace may come within the next few months, he cannot say that it is going to materially help the coal position this winter. Nobody realizes more than he, the importance of the industry, and its influence on the war. Hence his promise that "we shall endeavour to keep you supplied with coal in order that you shall not have to materially reduce your efforts." The endeavour of the Department, he added, is directed to putting in hand at least six weeks' stock for the winter peak load in the case of the gas-works that are most remote from the coalfields, while for those that are nearer, four weeks' stock is what is being aimed at.

Corrosive Action of Flue Dust on Fire-Bricks.

Now for the last item on the agenda. There was a report prepared by Dr. J. W. Mellor on the above subject, which report incorporated the results of experiments by Mr. Walter Emery. The report was presented by Mr. J. P. Leather, owing to this meeting clashing with that of the Ceramic Society. In furnaces, of course, there are many sources of dust—from producers, furnace charges, &c. It is even possible for the corrosive action to take place inside a gas-retort when the coal is mixed with a relatively minute proportion of limestone. If the spurting type of limestone be mixed with coal, a little lime is carried along with the escaping gas; and this readily attacks the inner walls, producing a glazed surface. The repeated charge after charge may shorten the life of a retort very much. The furnace which has been constructed for this experiment is described in the report; and the *modus operandi* of carrying out the experiments is explained. The various kinds of flue dust and fire-bricks are described, analyses are given, and an explanation made as to the action of the various kinds of dust on the bricks. A surprising thing is the depth of penetration of the dust. With two bricks side by side, the attack with a dust liable to corrode or slag the brick is inclined to be more vigorous with each brick at the joint than elsewhere. In general, it was found that the penetration by dust is greater in fireclay than in silica fire-bricks. In most cases the bond is attacked first; and the coarser grains last. In silica bricks, the depth of the penetration of the dust is generally less the finer the grain. In the fine-grained bricks, the coarser grains and the bond are both attacked; while in the coarse-grained bricks, the bond is alone attacked to any serious extent. It therefore follows that the bond of a silica fire-brick offers the feeblest resistance to the attack of a corrosive slag. The attack on the coarser grains of silica fire brick varies with the nature of the grains. When there is much cementing material between the quartz grains, the penetration of the rock fragments by the dust is greater than in the case of a compact rock made up of interlocking grains. Under oxidizing conditions, iron oxide does not corrode silica bricks to any noteworthy extent. When the dust is such that it can form a durable surface glaze, the brick is protected from further attack, or rather the subsequent rate of attack is considerably diminished. Mr. Leather ended his review of the report with the remark that such work as this would enable gas engineers to get the best service out of their settings.

With votes of thanks, and an expression of gratification from the President over the success of the meeting, the proceedings came to a close.

GENERAL REPORT.

A Special General Meeting of the Institution was held on Thursday and Friday last, at the Institution of Civil Engineers, Great George Street, Westminster.

Mr. SAMUEL GLOVER (St. Helens), the President, said: Before we start the meeting, I do want the members to feel that this

is a friendly gathering. It is their meeting. You have all had a printed notice calling the meeting; and we will therefore at once proceed to Item No. 1—

REPRESENTATION OF THE INSTITUTION OF GAS ENGINEERS ON THE PROPOSED RECONSTITUTED NATIONAL GAS COUNCIL.

I feel that it needs no words from me to explain what is meant by the proposed reconstituted National Gas Council. You have all been kept in touch with the proposals, which have been published in the Technical Press. At present, the draft suggestion is that the Institution of Gas Engineers should be represented on the Council of the new National Gas Council by four members. The number may be increased; but four is the suggestion at present. I, as President of the Institution of Gas Engineers, ask you to agree to form part in this way of the proposed reconstituted National Gas Council.

Mr. CHARLES CARPENTER, D.Sc. (London): There is one respect in which I suggest that a little more information might be helpful, and that is to what extent the members of the Institution of Gas Engineers will be bound in respect of labour matters. I read the accounts of the proposals that were given in the Press; but I certainly do not feel either happy or clear with regard to the extent to which, by joining the National Gas Council, gas undertakings would be bound in respect of their dealings with labour problems. If you can give us some assurance with regard to this, I feel it would be helpful to others as well as to myself.

Mr. R. G. SHADBOLT (Grantham): I wish to ask, considering that the scheme of the National Gas Council involves something more so far as the interests of the Institution are concerned than the mere nomination of four members—namely, the entire reorganization of the gas industry—whether, in view of this wider scheme, the Council of the Institution have had under consideration any such proposal, or any proposal on anything like identical or similar lines, with regard to the reorganization of the various bodies representing the gas industry, and other bodies that might be created or formed?

Mr. GEORGE HELPS (Nuneaton): Will Mr. Shadbolt move some resolution in regard to this matter? It is of very great importance—representation of an industry already vast, and likely to be considerably greater. Most of us know that only last year America considered exactly the same thing. Those who were members of the old American Gas Institute had all the papers showing the changes that were so well brought about. If Mr. Shadbolt will move it, I shall be very happy to second a proposal that the matter be adjourned for further consideration. I think it would be most unwise to go on with any change in regard to representation of the gas industry without giving every consideration to what our cousins have done across the water. If Mr. Shadbolt is not going to do it, I take upon myself the responsibility of moving that it be referred back.

Mr. SHADBOLT: My question was put as an inquiry, for my mind is in a perfect whirl. In my mind—and I daresay it is the same with many other members—the matter is not sufficiently crystallized to justify me in proposing a resolution. If I could see my way clear to do so, I would do it with alacrity, so that we may save time and come to a decision; but my mind is not in any such condition at the present time. I am merely seeking information, as I believe many other members are.

The PRESIDENT: There are many others of us who would, if they tried to take in the whole situation present and future, begin to get in a whirl of brain waves. It is to prevent our attempting to take in the whole situation, present and future, that it is suggested that this is a step in the right direction—a beginning of the process of crystallization, which many of you have watched, until the right moment has come to facilitate the operation by some touch which would complete the crystallization of the compound we are looking for. It is a step which clears the situation, and enables us to do work intelligently. What we do is to approve of the formation of a better constituted National Gas Council, and say that we, as the Institution of Gas Engineers, are willing to be part of the Council, inasmuch as four (or some other number), of our members will be members of the new Council of the newly constituted National Gas Council. In regard to the inquiry of Mr. Carpenter, this is very helpful; but inasmuch as the Institution of Gas Engineers does not undertake to commit either the Institution or the authorities that the members of the Institution represent in some capacity, it cannot, and does not, attempt to commit them either on wages questions or any other questions. I ask you to accept from your Council the assurance that it seems to be in the interests of the industry, and certainly in no way letting down the Institution of Gas Engineers, to pass the resolution submitted to you, that four members of the Institution be members of the Executive Committee of the newly-constituted National Gas Council, when that reconstitution has been completed. The position and future usefulness of the Institution will be helped and not decreased in any way by this step which we think it necessary to take in the first instance for the formation of the new National Gas Council. It will help the industry as a whole; and whatever helps the industry as a whole, helps to magnify the office of gas engineers. Nobody can let down the Institution of Gas Engineers except its own members. Its own members have never done so, and will not do so. Their office will be magnified in the future, I believe, by every step that the National Gas Council may take.

Mr. SHADBOLT: May I be allowed to ask just one other question? We have at the present time, I believe, representatives on the National Gas Council. It would refresh our memories and help things forward if we knew how many representatives we now have.

The PRESIDENT: We have four on the Executive Committee of the National Gas Council, and nine on the Consultative Committee.

Mr. SHADBOLT: So that we are not increasing or improving our representation by having four members on the new body?

Mr. R. W. EDWARDS (Aldershot): The whole representation on the National Gas Council is the same, and the representation on the Executive Committee of the National Gas Council remains the same—*i.e.*, four members.

The PRESIDENT: The relative position on the Council is hardly varied at all.

Mr. SHADBOLT: It seems to me that, before passing a resolution of this kind, we ought to approve the principle of the new constitution, as one of the constituent bodies of the new National Gas Council.

The PRESIDENT: The consideration of that will come on this afternoon at a meeting called for this particular purpose. What we wanted you to do this morning was to strengthen the hands of the Council in accepting this proportionate idea of members on the Council of the newly constituted (when it is constituted) National Gas Council.

Mr. SHADBOLT: We should not begin to elect representatives to the reorganized body before we know whether we have approved of the scheme or not, because we are one of the important constituent bodies.

Mr. J. P. LEATHER (Burnley): I think we are getting to the end before we have got the beginning. The great point is that we here, as the Institution of Gas Engineers, do not represent the industry, as we are simply a professional technical body. We have no legislative powers with regard to charges, as Mr. Carpenter said, or anything of that kind whatever. We cannot do anything to commit the undertakings we are only representing in the sense that we are technical advisers. We are not representatives of the gas undertakings; we do not at all occupy the position that the National Gas Council ought to occupy as representing the gas industry in meeting outside bodies such as the Government. The Government—we have been forced into this question with the authorities by war conditions—have naturally looked for some body representative of the gas industry. The Institution of Gas Engineers does not in any sense whatever represent the gas industry. I have a great respect—I want a better word than respect, pride or affection is the word I want—for the Institution of Gas Engineers. I have been a member of this body and of its predecessors, I think, for something like 35 years. I go back in my recollection even further than that, because my father was one of those who met at the preliminary gathering to inaugurate the British Association of Gas Managers; and these different bodies have served an extraordinarily useful purpose in the gas industry from the technical point of view. In the National Gas Council, however, we are meeting something quite different. We all understand that the Council have done exceedingly good work. I think anyone who has followed the work of the National Gas Council knows they have done very good work, and that this work wants to have more authority behind it. The proposed Council is one which will really represent the undertakings of the country. I think the President has rather omitted to put this point forward. The proposed new National Gas Council will have representatives of every undertaking in the country that chooses to join it. The Institution will only be represented, certainly, as a minority in itself, although, of course, naturally the members of the Institution will be members of the National Gas Council to the extent that their undertakings appoint them as their individual representatives, and, consequently, the members of the Institution, considered as administrative officers of their undertakings, will still have a great weight on the National Gas Council. But when we come to the Executive Board of the National Gas Council, which is naturally a very important thing indeed, then the Institution, as an Institution, has only its small representation of four. The District Boards, however, that will be formed will also have their representation on the Executive Board. I do not think our main point this morning is to consider whether we think four a proper representation of the Institution, but whether we are of opinion that the present time is a proper one for forming an association which shall be really representative of the gas industry. I do not know that it is for me to answer the questions that Mr. Carpenter has put; but as a member of the National Gas Council Executive, I may say that my understanding of the matter is that the wages question will really not come under the purview of the National Gas Council as such. One of the articles of the proposed National Gas Council is that it should look to organizing a body which could deal with such questions, but it, as a National Gas Council, would not itself have power to deal with wages questions.

Mr. HELPS: May I put a question? I think a great many of our minds are not very clear—at any rate, my own is not. Am I to understand, or are we all to understand, that this unity of command that we have looked for in this great industry of ours is to come from the National Gas Council, the Institution of Gas Engineers, or the British Commercial Gas Association? There are three bodies; and they are mixed up—muddled up, to my mind. I daresay there are other minds in the same state; and if this could be elucidated, it would be very helpful. We must have unity of command.

The PRESIDENT: I would like Mr. Helps to help us to understand what he means by the word "command" in this relationship.

Mr. HELPS: The industry has got to be represented as a whole; and there must be a head of it. Here we have three separate and distinct bodies; and I do not know to which of these bodies to appeal in connection with any matter that may crop up.

The PRESIDENT: Then I think the answer to your question, Mr. Helps, is that the newly-constituted Gas Council would be the head, after its formation, to which you would look in such matters. I think it is clear that this meeting of the Institution of Gas Engineers agrees with the principle that is being aimed at and set forth in the articles of the newly-constituted National Gas Council, and we accept your assurance. The next item of business——

Mr. H. C. HEAD: May I say a word before you leave this matter. I am not at all sure that we do all approve of the constitution of the new National Gas Council. I do not wish to say that I disapprove. At the same time, however, we have not had the matter in our minds for any considerable time; and I think it is rather premature to say that we do approve. I consider that any action by the Institution which would give countenance to the view that the President has briefly set forth would be a very great mistake. We ought to reserve our position. It would be not only discourteous, but unwise, not to accept the invitation of the National Gas Council to appoint four members on their Board, the newly constituted Board; but I think we should appoint these members not as members of the Board of the newly-constituted National Gas Council, but as members of a Board to consider the reconstitution of the National Gas Council, and report to the Institution of Gas Engineers in due course. I do not think at this moment the Institution should pledge itself one way or the other, and I do think that the Institution should move very slowly. Keep moving by all means, but move slowly, and particularly see that the interests of the Institution are not prejudiced in any way whatever.

The PRESIDENT: The meeting has almost unanimously approved of the principle.

Mr. SHADBOLT: There has been no vote.

The PRESIDENT: I asked you. [Cries of No, No.]

Mr. SHADBOLT: There has been no resolution or vote.

The PRESIDENT: I thought the meeting was so absolutely in sympathy. [Laughter.]

Mr. SHADBOLT: It would help us if the Council would explain what they wish the meeting to do, because they must have had the matter under consideration.

The PRESIDENT: The Council hereby recommend that you should accept, here and now, the principle of the reformation, on the lines set forth, of the National Gas Council, and that our representation be in some such proportion of numbers as mentioned and explained this morning. Those who agree with this recommendation will please show it in the usual way.

Mr. SHADBOLT: There is no resolution.

A MEMBER: Put it as a resolution and you are safe.

Mr. HERBERT LEES (Hexham): Does it want a resolution? If so, I propose that the Institution approves of the principle as set forth in the reconstitution of the National Gas Council. Some of us have come to London this week for the purpose not only of attending this meeting, but also the meeting of the National Gas Council this afternoon; and we have come prepared to support the new proposal. We shall be in an invidious position if we, at this meeting, take part in a disapproval—if the meeting should do so—and then go to the other meeting and approve. I hope there will be no feelings as to any one section of the industry being paramount.

The PRESIDENT: The word "command" has been explained away in any wrong sense.

Mr. LEES: One can hardly tell what has been explained away after Mr. Helps has spoken; but I do want us to forget that there are distinctions, for in this matter we are all working together. The National Gas Council are not subversive to the interests of the Institution of Gas Engineers. We shall always be part of the Council, and a very strong part. It is forgotten that the District Boards, when they are appointed, will be largely representative of gas engineers and gas officials generally; and we have nothing whatever to fear. We are strong enough to hold our own in any organization that may be formed; and our interests will not suffer by giving our adherence to this scheme. If it has not already been proposed and seconded, I am prepared to do either one or the other and get to business.

The PRESIDENT: That is the resolution I propose; and I propose it as President. I understood that it would either meet with such an explanation of the position that I should be able rightly to judge the feeling of the meeting, or that it did not need any seconder at all. If I am going to propose it, I am going to propose it in this way. If it is not for me to propose it in this way, I shall ask someone else to propose it. But this is the feeling of the Council: "That this meeting approves of the principle as set forth by the National Gas Council for reconstruction."

Mr. JOHN KELLY (Bridlington): I will not detain you a moment; but, before I go too far, I want to know what is meant by committing us to the principle of the proposed reconstruction. Does it mean, for instance, that we are committed to the principle of one vote for every 250 million c.ft. of gas sold? If we are committed to that principle, then I shall know anyway which way I am to vote.

The PRESIDENT: I do hope you will not wish to go into the whole of the details. If you approve of the principle, the National Gas Council will go on with its work of reconstruction to the satisfaction of the industry.

Mr. KELLY: How shall we know that? Will the details be submitted to us later on?

The PRESIDENT: Yes.

Mr. KELLY: Are we pledging ourselves to them now?

The PRESIDENT: The details will be submitted to you later on.

Mr. KELLY: Before ratification?

The PRESIDENT: Quite so.

Mr. EDWARDS: I think we want to get on this morning with this matter; but at the present moment we are rather in a mist. The position is that we are here to decide definitely the reconstitution of the National Gas Council. There are three bodies—the Institution of Gas Engineers, the Gas Companies' Protection Association, and the British Commercial Gas Association. The object of the National Gas Council is to consolidate and concentrate the efforts of the gas industry to present one voice to the world. In a sense, we have in the Institution of Gas Engineers the technical side of the industry; in the British Commercial Gas Association, we have the commercial section; and in the Gas Companies' Protection Association, we have the legal and parliamentary section. These individual Associations, by themselves, have been found not to be strong enough in their efforts, particularly during the war. Profiting by their experience—I am speaking as a member of this Institution—we have felt that the only natural course to take was to concentrate and consolidate our efforts into one body; and that body is the National Gas Council. The National Gas Council, so far as this Institution is concerned, will be composed of the Council of the Institution of Gas Engineers, not a part; and on the Executive Committee there will be four members of the Council of the Institution. On the Executive Committee there will also be four members of the other bodies. In addition to this, as you know, we are having District Boards; and the idea is to represent the industry root and branch throughout the whole country, and to encourage independence of thought and action in the various districts, except on imperial points, which, you will agree, should be submitted to the central body. But I might go a step further. We have found during the war that we have been handicapped because we only represent these three bodies. We are not represented on the National Gas Council in regard to tar, sulphate of ammonia, benzol, and other things; and the idea is that we should represent these different Associations and deal with these interests. It seems to me a simple thing. We surely have made up our minds that the gas industry after the war will have to meet the greatest possible competition. The electrical industry is preparing itself for tremendous competition; and if we hesitate to do the same, it will be a serious thing for us. I urge that we make up our minds, as men of business, that we are in favour of this proposition—that we do support the action of the Council, and that we do intend to form part of the National Gas Council, so that the whole thing can be completed at this present meeting.

Mr. H. KENDRICK (Stretford): My recollection of what transpired at the meeting of the National Gas Council is that the Chairman of the Executive Committee stated, and emphasized the fact, that the Council, in dealing with Government Departments, found itself often in difficulties because it was not a representative body. Although it represented four Associations connected with the industry, it was not directly representative of the gas industry itself. The Council has to call, as you are aware, several times, meetings representing the gas industry in order to get the necessary authority to carry through certain negotiations. This means very considerable loss of time. Then it was pointed out that, under the Whitley report, it was necessary for us to have a representative body of gas-works employers in order to meet, on wages and other industrial conditions, the various unions in which the gas workers were represented—that, unless we did appoint such a body (and powers are taken under the proposed rules to form such a body), the Government itself might, in all probability, constitute a body on terms which probably would not be at all favourable to the gas industry. I think, from this point alone, it is desirable that the members generally should approve of the principle of the Council. I speak personally. I brought this matter before my Board at their last meeting, and was empowered to support it.

Mr. CHARLES CARPENTER, D.Sc. (London): I do not want to be obstructive; but I must point out that the last speaker has put me into conflict with him upon the functions which the National Gas Council are to provide in the future in respect of trade unions. I have had some experience in this matter, because I have been associated with the formation of the Association of British Chemical Manufacturers, and this same question came before them. The Government put on a great deal of pressure to induce that Association to deal with labour matters in addition to all others appertaining to the industry. The Association absolutely declined to do anything of the kind, because they felt in so many ways that it would split and hamper the usefulness of the Association, quite apart from labour problems. The difficulty was overcome by forming an Association or Federation of Chemical Employers, which, and which alone, is the authority for dealing with trade unions. Now, the particular advantage of this is that you have an Association of a great many men interested in the progress of the chemical industry, and they are not bound hand and foot by reason of the fact that they have got

to follow whatever procedure may be laid down in respect of trade unions. I must ask to give an instance which I do think is an important one. I do not know whether I have misunderstood, from the somewhat obscure references to it in the Press, the connection of the Gas Council to the Association of Tinplate Workers. Now, the Tinplate Workers' Union, though it is a small one, is one of the strongest in the country; and I was told by a man who ought to know what happened when the Officer for Dilution of Labour went to the works. He went round the works and found in one of the buildings a large number of women employed making ganes for shells. The Dilution Officer went through the shop and was perfectly satisfied. The next shop that was visited was occupied by the tinplate workers; and the Inspector asked what was going on. He was told what was going on; and he said, "I don't want to go in there." The reason is that the Tinplate Union will not accept dilution with women labour; and they fought me on the question of the employment of wounded soldiers. I am sorry I must go into detail; but I think this is important. On Aug. 14, 1914, we issued a notice that we would stand by everybody who did his bit for the country in its time of peril; and in carrying out this pledge we have had a Special Committee of the men, who have discussed and settled in what ways these wounded and maimed soldiers, who are now almost day by day returning from the front, can be employed. For a man who is short of a leg, one of the useful directions in which we think employment can be found would be by employing him in the repair and maintenance of our meters, both slot and ordinary ones. So we set to work in order to carry out this proposal. Then we found that this did not meet with the approval of the men concerned. I had a talk with them about it, and I told them the conditions under which we were going to work. I said, "Now, I undertake that we will not allow the employment of wounded soldiers or of women to lower your wages in any way. I will also undertake (and I can) that, by reason of their employment, we shall not reduce the amount of work available for you, because we want far more work than you can do; so that you will not in any way be likely to lose your jobs. I guarantee that there is plenty of work for all of you. I do not ask you to take wounded soldiers by your side and teach them the trade; I can get volunteers sufficient to do that. I do remind you that we are under an obligation to do what we can for those who have fought for the country." They said: "That seems all right, and, personally, we do not see any objection; but we must rely on our Executive." For the first time I discussed the matter with the Executive; and I found they were immovable. The result is that I lost 15 men. But in the place of these 15 men I have got 31 maimed soldiers repairing meters—men with only one limb or an imperfect limb which they lost in fighting for us; and I have got, in addition, 76 women also doing their bit, releasing men who are thus available for other purposes. What must my feelings, or your feelings, be when the Gas Council puts forward the suggestion that these people who will not have dilution, who will not agree to the employment of maimed soldiers, are to be more protected than they are at the present time? I do not know whether I have misunderstood the action of the Gas Council.

The President: I hope you have.

Mr. Carpenter: If I have, I am glad to hear it. I am not on the Council; and I can only go by what appears in the Press. But to revert to the point I raised when I started. The two stories we have just heard, of what occurred in the Council, do not agree; and I do suggest that unity can be obtained in this industry, and yet keep apart the difficult and thorny subject of the relations with trades unions. I would impress upon the meeting this important fact, which the Government and so many people in the land seem to have overlooked. The idea—it is set out in the Whitley Council—is employers in the one camp, trades unions in the other, fighting one another and seeing what they can get. This was the method of working I was used to in 1889; but for 28 or 29 years I have had quite a different state of affairs. I have men working with the employers in harmony and sympathy, with the whole of their goodwill; and I cannot give you a better example than to mention an episode concerning the difficulties with which you have been familiar—again through the Press. I do not know to what extent the Press is accurate. As I understand matters, the relationship of some of the undertakings with their men has not been altogether a happy one. Some of our men have told me certain companies are actually putting pressure on their men to join the union. All I can say is that the workpeople with whom I am associated have, I am pleased to say, agreed to a notice being put up at the various works that the works are free from any Prussian, or trade union, control, which is almost the same thing—I am bound to speak freely—and that the works are free. No one is under any compulsion either to join, or to abstain from joining, their union. I do urge that the future is not with trade unionism at all. The future of industry in the country, in which Government officials are so badly trained and so bigoted and so cowardly that they are never able to resist until they are jambed-up in a corner as they were in the railway strike, they have so little vision, and are so narrow-minded, they can say nothing to a trade union—the future of the country is not in trades unionism, but in co-partnership; and I ask you, before you pin yourselves to this, to see that it does not result in the gas industry becoming one big target to be shot at by those whose business it is to agitate. I gave you the case of the chemical industry, because that has been through very similar difficulties. There was no organization in the chemical industry when the war broke out. We have now an organization absolutely recognized by the authorities, by Dr. Addison, the Minister of Reconstruction, and everywhere, which has got a status and a standing with the Government. All this has been the growth of the last three or four years. But labour questions have been kept perfectly separate. They are dealt with fully and wholely and solely by the employers trade federation; and I most emphatically urge that you will have nothing whatever to do with an association—the National Gas Council—that binds you in respect of labour.

Mr. Lees: May I now propose—"That this meeting approves of the principle of the proposal of the National Gas Council, and decides to give general support to the scheme of reconstruction." This does not commit us to details. The question that was asked by Mr. Kelly with regard to voting is a matter to be settled hereafter. It cannot be settled at this meeting. The question of a Joint Industrial Council is a matter for each undertaking to settle. The constitution provides for the formation of a Committee of Employers for the purpose of forming a Joint Standing Industrial Council. Every undertaking will settle this point for itself; and I think it will be found that many undertakings, at any rate at the beginning, will refrain from joining the Industrial Council, while a good number will at the same time find it more convenient for a central body to deal with matters of this sort. I want to make it clear that no undertaking is compelled to join the Joint Industrial Standing Council. That is for each undertaking to decide for itself; but the constitution of the new National Gas Council provides that such a Joint Industrial Standing Council shall be set up for undertakings willing to join.

The President: I believe, also, there is a quite satisfactory answer to Mr. Carpenter's questions on this point.

Mr. Lees: I hope so. We are not committing ourselves to more than the general principles of this scheme. We shall have an opportunity of discussing the details, I expect, this afternoon; and any difficulties that may have arisen here will be cleared up probably when we get the full Council together, and especially the Committee who have drawn up the details. Many suggestions have already been made with regard to details; and I have no doubt they have been taken into consideration. The most we can do, and the least we can do, is to adopt the principle in so far as the constitution is concerned.

Mr. Carpenter: Will it be in order to take the sense of the meeting as to the advisability of having a separate organization to deal with these problems of labour?

Mr. A. E. Broadberry (Tottenham): I rise to second the proposal that the draft of the scheme of reconstruction be adopted, as it has had the very careful consideration of the Institution. Mr. Glover, as President, Mr. Price, as Hon. Secretary, and I, as Past-President, have had an opportunity of considering the proposals; and we have had ample evidence that not only will the prestige of the Institution be well maintained under the proposed constitution, but that it will be very materially strengthened—that we shall have, in the future, behind us in our technical work the assistance and approval of the united body of the industry. Mr. Carpenter's fear about wages questions and dealing with trade unions is, I believe, thoroughly well met by the fact brought out by Mr. Lees—that the Employers Committee is to be optional to any of the members of the National Gas Council. With regard to details, of course, they can only be properly discussed at the meeting of the National Gas Council this afternoon. It would not be appropriate for us to discuss the details, such as has been suggested, as to voting power, and that sort of thing. I have very much pleasure, therefore, in seconding the resolution.

Mr. S. O. Stephenson (Worthing): I should like to ask you, Mr. President, before you put that, whether all the members here are invited to attend the meeting of the National Gas Concil this afternoon? [Members: No.]

The President: Your representatives who have been conducting this business for you, with your confidence, are invited.

Mr. Stephenson: When it comes to details, we want to know precisely what they are. It is a very difficult thing to vote like this in the dark.

Mr. Kelly: With regard to my inquiry, it seems to me that the particular matter of the constituency which is to form the National Gas Council is going to be prejudiced, because it will not have an opportunity of voting until it is constituted. If the constituency is to be one that is to be strictly limited by a certain power of voting, the constituency itself should be called together in a body and allowed to determine what that voting power is going to be. You have drawn up a scheme which proposes to grant certain voting power; and if we are committed to the scheme, then the whole thing is going to be decided by the smaller body, and not by the constituency itself. We shall be committed to it, and we shall not get out of it. The gas industry will be committed to a scheme of various representative bodies; and it will be represented in a way decided for it, in the same way that the constitution of Germany is decided—by the head, and not by the body itself. But the body is going to be the gas industry, mainly composed of gas undertakings; and the gas undertakings are not determining the voting power in the new constitution in any way whatever, so far as I can see, and is not likely to. I shall be very glad if I am wrong.

The President: We are not determining now all these details. A meeting of the whole industry will be called for the decision and acceptance or otherwise of the details of which you are now talking.

Mr. Carpenter: I propose this amendment. I do not know

whether it can be used as a clause of the resolution—"That this meeting thinks it desirable that a separate organization should be formed to deal with labour matters."

Mr. T. N. RITSON (Chichester): I will second that.

The PRESIDENT: I understand that the proposal deals with all such matters, and that the new National Gas Council will possibly be invited to form committees; and that, I think, if not entirely, would very largely meet the needs of Mr. Carpenter.

Mr. CARPENTER: Having regard to the want of unanimity of opinion on the National Gas Council itself as to its future deliberation, I think it is desirable to have some separate organization for dealing with the matter to which I have drawn attention, and therefore I propose my amendment.

Mr. LEATHER: As this is a very important matter, I would like to read the actual clauses dealing with this question in the constitution of the new National Gas Council:

> XV.—"The Council shall [I suggest this should be altered to may] form a Committee, called the Committee of Gas Employers, which shall consist of the elected representative members in each district, provided that each individual member is authorized by the undertaking nominating him to act in this capacity, and to bind his undertaking by his vote. [Note: The rules of the National Gas Council shall apply, with the necessary modifications, to the Committee of Gas Employers.]
>
> XVI.—The Committee of Gas Employers, formed in accordance with Rule XV., shall have authority to form a Joint Standing Industrial Council for the industry.

This is only permissive——

The PRESIDENT: "Shall have authority to form."

Mr. LEATHER: Yes; and I suggest that Mr. Carpenter's amendment might be altered slightly, so that the National Gas Council, which is being reorganized, should not form a Committee or Council to deal with labour matters except by a full and properly constituted assembly representing the gas industry. I think that is really the main point of Mr. Carpenter's objection, and also the objection that has been raised elsewhere—that nothing shall be done without the consent of a proper meeting representing the whole of the gas undertakings.

Mr. A. F. PHILLIPS (London): Mr. Carpenter's amendment has been seconded.

The PRESIDENT: I did not know it had been seconded.

Mr. LEES: What becomes of our support to this scheme if the amendment is passed?

The PRESIDENT: It would mean that the scheme for the formation of the new National Gas Council would go forth with the suggested amendment for them to consider. But I would like Mr. Carpenter to tell us whether the explanation now given helps him to reconsider his amendment, and to see that this matter is sufficiently separated from the duties of the National Gas Council as it is proposed to be formed. Does not that satisfy him?

Mr. CARPENTER: I take the attitude I do as the result of having given careful attention to these clauses in the typewritten copy which has been circulated, and of which I have a copy. I do not see that it will in any way whatever hamper the negotiations or the arrangements by passing a resolution of the kind that I have tabled.

The PRESIDENT: I put the amendment.

Mr. S. B. LANGLANDS (Glasgow): With regard to Mr. Carpenter's amendment, the point is this, that the weakness is shown by Mr. Lees' motion. He says that only those who wish to join may join. What force has a body of that sort?

The PRESIDENT: It is a weakness and a strength. It naturally strengthens the hands of the National Gas Council to form such an additional body as it is requested to form.

Mr. LANGLANDS: Does that give strength to the gas industry? I say no. Unless you can go forward speaking freely, then you should not go forward at all. The whole thing is more or less in the melting pot.

Mr. C. S. SHAPLEY (Leeds): Would not it help if we had it properly cleared up who is entitled to attend this meeting of the National Gas Council this afternoon? I happen to be the representative of a fairly large undertaking; but I have received no intimation of any such meeting. It would help the voting on Mr. Carpenter's amendment if we knew whether we are entitled to attend the meeting.

The PRESIDENT: I have answered that question to another part of the room—that it is your representatives who have been dealing with this matter, with your confidence, who are going to meet this afternoon for a preliminary meeting before the whole subject is brought before the industry; and I should like to ask Mr. Carpenter if he will allow his amendment to be used as a rider to the general resolution.

Mr. CARPENTER: Certainly.

The PRESIDENT: Thank you very much. With Mr. Carpenter's suggestion as a rider to the resolution, I put the resolution moved by Mr. Lees.

Mr. EDWARDS: Will you put it—"Provided the National Council shall not be at liberty to form a Wages Committee; but that all questions of wages be referred to a separate body." You refer to a separate body; but we would like to have that made quite clear.

Mr. CARPENTER: "Provided that, in the opinion of this meeting, a separate organization should be formed for dealing with labour matters." That is the spirit of the thing; and I do not think it matters whether it goes as an addendum to the original resolution or as an amendment, provided it is in the form of a resolution coming directly from this meeting.

The PRESIDENT: We are very much in spirit on that point.

Mr. CARPENTER: I want to be certain of the flesh as well.

Mr. LEES: As the proposer of the original resolution, I take it now that Mr. Carpenter's suggestion may be added; but it seems to me that this is exactly what the draft provides for—a separate organization formed to deal with wages questions. I do not mind it being mentioned twice.

Mr. BROADBERRY: As seconder, I agree with what Mr. Lees says.

The PRESIDENT: You have this way got both the body and the spirit, Mr. Carpenter.

Mr. CARPENTER: Do I understand that the mover of the original resolution accept my resolution as an addendum.

The PRESIDENT: Yes, notwithstanding that it appears already.

Mr. CARPENTER: That does not matter; I want to understand that they accept it as part of their original resolution.

Mr. LEES: I am quite prepared to accept it, notwithstanding that it is already in the Articles of Association.

Mr. CARPENTER: I have read it, and am not at all happy about it. I was wondering whether a "Bismarck," or somebody else, was behind it.

The PRESIDENT: I appreciate Mr. Carpenter sticking to his points, and I hope it will be carried.

Mr. LEES: I only want to know what we are going to carry. I will read my resolution, and if Mr. Carpenter will let me have his, I will read that also—"That this meeting approves in principle of the proposals of the National Gas Council, and decides to give general support to the scheme of reconstruction." That is what I propose. If Mr. Carpenter can draft his on to it without spoiling it—

Mr. CARPENTER: I think you will regard my addition as an ornament—"Provided that a separate organization be formed for dealing with labour matters."

Mr. EDWARDS: One point. Within or without the National Gas Council. Which is it to be?

Mr. CARPENTER: I am sure we can define what is a separate organization. We have Lord Moulton, a distinguished lawyer, here, perhaps he will give an opinion. I think we can leave it at that.

The PRESIDENT: I hope Mr. Edwards will accept my assurance that we shall leave this matter for further consideration. Mr. Lees' resolution, with Mr. Carpenter's addendum, is now before the meeting. It is seconded by Mr. Broadberry, and is ready for your support.

Mr. LEES: I am not quite clear that we are right yet. I am not quite sure what Mr. Carpenter means. On the face of it, it means that the separate organization is to be formed by the National Gas Council.

The PRESIDENT: He does not say so. He leaves it as Mr. Edwards has consented to leave it.

Mr. LEES: All right.

The PRESIDENT: We are now prepared to vote.

The resolution was declared carried unanimously, amid considerable applause.

The PRESIDENT: There are friends of the Institution here who have come to join with us this morning; and I can assure them that they need not be anxious about the Institution, whose interests will be well looked after in a proper manner. I am indeed much relieved by the unanimity with which this business has now been passed.

Mr. STEPHENSON: It is very awkward to bring us here without any details. Most of us know nothing about the details; and before we are asked to give a decision on a thing like this, the details should be sent to everyone.

The PRESIDENT: The details will be sent to you before they are decided upon.

Mr. JAMES PATERSON (Cheltenham): They have appeared in the Technical Press. I have read them there.

CONGRATULATION ON MILITARY SUCCESSES.

The PRESIDENT: It is proposed to send in your name—I am sure that you will gladly support us in this—telegrams to His Majesty the King and to the Commanders in the Field to congratulate them upon the great successes they are winning for us, and to assure them that we at home are doing everything we possibly can to strengthen their hands in the victory they are quickly gaining for us. [Applause.]

GAS INVESTIGATION COMMITTEE.

The remainder of the morning sitting, and the whole of the afternoon, were devoted to the introduction of, and discussion upon, the preliminary report of the Gas Investigation Committee, the contents of which were described by Mr. J. M. Wood, M.Sc., the Research Chemist.

LIFE OF GAS METERS RESEARCH COMMITTEE.

On Friday, reports were submitted and discussed by Mr. J. G. Taplay "On the Corrosion of Dry Gas-Meters," and by Mr. B. R. Parkinson on "Unaccounted-for Gas."

A break was made in Friday morning's proceedings, for the purpose of hearing some remarks from the Controller of Coal Mines (Sir Guy Calthrop).

A Message from the King.

The President: Will you rise in your places, gentlemen, to receive the following message from His Majesty, in answer to the one you sent him yesterday?

Buckingham Palace,
Oct. 17, 1918.

To Samuel Glover, Esq.,
President.

The King has received with pleasure and satisfaction the message which you have addressed to His Majesty on behalf of the Institution of Gas Engineers, and asks you to thank them for their expressions of loyalty and devotion. It is very gratifying to the King to receive their assurance of firm resolve to contribute to the utmost of their power towards success and victory.—Private Secretary.

The Coal Controller on the Situation.

Addressing Sir Guy Calthrop, Bart., who was present at the meeting according to promise,

The President said: Sir Guy, I asked if you would be good enough to come and spare us a short time from your very busy life, during which you are doing so much for the whole nation and for the Allies, to address the Institution of Gas Engineers at their half-yearly general meeting; and you have very kindly consented to do so. I am personally very much obliged to you, and can assure you that the Institution, and every gas engineer in the country and in the Allied countries is working to the best advantage he can, very loyally, and very energetically, and under great strain and highly adverse circumstances.

Sir Guy Calthrop: Mr. Glover and gentlemen. It is a great pleasure to me to have this opportunity of coming here for a very few minutes, and addressing your meeting. It is a pleasure to me, because I am glad to have the chance of expressing my gratitude to the industry for all the assistance that it has given me during the time that I have been Controller of Coal Mines. I know that, in coming here, I may be more or less coming into a "lion's den." I know there are such things as 15,000 c.ft. of gas per ton. I know you are not entirely satisfied with the regulations that have been issued in these matters. Of that I have no doubt. [Laughter.] Your Council have made it quite clear to me; but equally I may say that neither have I satisfied anybody else. [Laughter.] So I think that, on the whole, we have probably—at least, we have endeavoured to do so—dealt with justice as far as possible; and we shall continue to do this. But whether or not you have agreed with me or my Department, I should like to say that all your criticisms and all your comments have always been of a constructive and not of a destructive character; and though we have not always been able to accept all you have said, I know the advice you have given has been the best you could give. We are trying, as far as we possibly can, to hold the balance evenly towards all the interests we have to deal with in connection with the control of coal.

Well, it looks as though there may be a peace within the next few months, perhaps before the winter is over; but so far as I can see at the present time, I do not think even a quick peace is going materially to help the coal position of the country this winter. I am quite sure, therefore, I can rely on your industry to continue during this winter the efforts you have been making ever since the war started. We have got an unscrupulous foe wriggling. He will continue to wriggle as long as he can; and when I go round addressing the miners, mine owners, and mine managers, I always appeal to them to continue their efforts until it has been put absolutely out of the power of our enemies to do any further evil. We have got to see this thing through; and I know that the heart of the British nation is right in this respect. The foe will endeavour to avoid having to meet justice—justice that will deal faithfully with him, I hope, for all the harm, and all the devilry he has done during the last four years.

I can assure you that nobody realizes more than I do the importance of your industry, and that it ministers not only to the comfort and the necessities of daily life, but also that it has done an enormous work in the producing of various things required in the conduct of the war. This, of course, makes it all the more important that there should be no reduction of the possibilities in that direction which is not absolutely unavoidable; and so far as we are concerned in the Control, we shall endeavour to keep you supplied with coal, in order that you shall not have materially to reduce your efforts. So far as the undertakings are concerned which are more remote from the coalfields, we are hoping that by the end of this month there will be at least six weeks' stock in hand at the works of coal required to carry the winter peak-load; and so far as those undertakings are concerned which are nearer the coal districts, we shall endeavour to keep the supply up to four weeks. If we could have improved on this position, it would have removed a great source of anxiety from the Control; but we have not been able to do it.

I know I shall have the assistance of all of you in trying to meet the situation if a greater emergency arises than we now see. Fortunately, last year we were able to start the winter much better than this winter; but you cannot fight a war without men. They have had to go from the mines; and they are the finest fighting material that can go into the army. Therefore there has been a difficulty in getting the coal. I hope, and believe, we shall pull through this winter with a minimum of discomfort and a minimum of hardship; and I am equally sure that I may rely on your cordial assistance to this end. I thank you very much for giving me the opportunity of saying these few words to-day.

The President: I am sure you will desire me to thank Sir Guy Calthrop in your name for his attendance here, and for his message and the measure of comfort he is able to bring us, in connection with the carrying on of our very important industry.

Refractory Materials Committee Report.

The report of the Refractory Materials Committee on the "Corrosive Action of Flue-Dust on Fire-Bricks" was submitted by Mr. J. P. Leather, who said he was sorry the report could not be presented personally by Dr. J. W. Mellor and Mr. W. Emery.

The President: I am sure we are very much indebted to Mr. Leather for the masterly way in which he has given us his report. It fell to him to undertake the responsibility of doing this, owing to the fact that the Ceramic Society are meeting to-day in Swansea. I have a letter from Dr. Mellor saying how sorry he was that these meetings had been so fixed that the dates clashed; and he has promised that no future meetings of his Society shall be arranged without his knowing the dates of the Institution meetings. In this work, as in the other investigations, you may conclude that the report submitted is only a preliminary one. I propose that the thanks of the meeting be given to Mr. Leather for presenting the report to us, and that the report be accepted and published in our "Transactions."

This was unanimously agreed to.

Concluding Business.

The President: Now, what more can I say, but to explain to you that the report brings to an end the proceedings at this the first half-yearly meeting of the Institution of Gas Engineers for doing this sort of work. The Council and the whole Institution may feel gratified that the meetings have been so well attended.

Mr. J. Terrace (Great Grimsby): Before we separate, I should like to propose a hearty vote of thanks to the President for taking charge of this meeting, which has been a departure from our usual custom, but which I think everyone will agree has been an unqualified success.

This was seconded by Mr. J. C. Wright (Romford), supported by Mr. C. E. Jones (London), and carried by acclamation.

The President: Nothing could be more gratifying to me than the knowledge that I am doing your work to your satisfaction. We have to thank the Council and members of the Institution of Civil Engineers for their kindness in according us the use of their theatre in which to hold the meeting.

MORE ABOUT REFRACTORY MATERIALS.

At the Fifth Meeting of the Refractory Materials Section of the Ceramic Society, held at Swansea last week, a number of important communications were read.

Mr. J. A. Howe, B.Sc., gave an account of the distribution of refractory materials in South Wales, including silica rocks, fire-clays, and dolomite limestones, our knowledge of which—especially of the two latter—is admittedly very imperfect. Stress was laid on the need for thorough investigation. "Magnesite as Raw Material" was the title of a long paper by Mr. T. Crook; the treatment being on a comprehensive scale. A discussion by Mr. W. Donald supplied additional details.

Mr. G. W. Mottram read a paper on "Refractory Bricks Made from Non-Plastic Materials," in which he advocated the use of a proportion of fine material—as is done by portland cement makers—to greatly increase the strength of the products, whether it be of silica, magnesite, or chamotte, &c. For the best result, a gradation is suggested from (say) 200-mesh (or even finer), up to particles of ¼ in. diameter. Good results were obtained from 90 p.ct. grog and 10 p.ct. fire-clay, by grinding the raw clay to a fine slip with two or three times its weight of grog, and then mixing with the remainder of the ground grog. Bricks made from calcined Stourbridge fire-clay on this principle showed no contraction after repeated burning. In like manner, with silica bricks, if 15 to 30 p.ct. of material be ground with lime, clay, or other binder to a fine slip, and then adding the mixture to the rest of the graded silica material, the binder is brought into intimate contact with every particle of the silica. This method of preparation should, in Mr. Mottram's opinion, enable many silica rocks to be used which are at present regarded as valueless for making bricks.

Dr. J. W. Mellor and Mr. W. Emery contributed a valuable report on "Corrosive Action of Flue-Dust on Fire-Bricks." This report was also presented by Mr. J. P. Leather, of Burnley, to the Institution of Gas Engineers on Friday, and will in due course appear in the "Journal." Dust in furnaces may originate in the coal ash from the producers, dust from furnace charges, &c. Such action is even possible inside gas-retorts, when the coal is mixed with a relatively minute proportion of limestone. Some limestones spurt or decrepitate when heated; and if such limestone be mixed with the coal, a little lime is carried along with the escaping gas, and readily attacks the inner walls, producing a glazed surface. This repeated charge after charge may very much shorten the life of a retort. Among the various flue-dusts, &c., experimented with was a deep red dust from the top of the retort-bench of a gas-works, containing 20·40 p.ct. of silica, 10·07 p.ct.

alumina, 55·86 p.ct. ferric oxide, 3·31 p.ct. sulphur trioxide, 2·25 p.ct. of lime, 2·60 p.ct. of potash, 3·84 p.ct. loss on ignition, 0·74 p.ct. of soda, and 0·55 p.ct. of magnesia. Preliminary tests showed that, with this material, sintering had just commenced at 1100° C. melting-down had resulted at 1200° C; there was no corrosion at 1300° C.; while at 1400° C. there was slight corrosion and penetration. Generally speaking, at temperatures below 1300° C. the action of the dust was found to be mechanical rather than chemical. Further trials were made at 1400° C. on bricks of fire-clay and silica. With the red dust referred to above, the upper surface of a fire-clay brick was glazed and corroded to some extent; and there was considerable cracking. The dust was found to have penetrated completely through the brick. The grog suffered little in attack; but the bond clay was permeated with the dust, the upper layers having melted. In the case of a silica brick, the surface was much corroded; but the attack was confined mainly to the bond, the larger grains standing out in relief. The average depth to which the dust penetrated was 2·5 cm. The results of microscopic examination (by Dr. A. Scott) were interesting. In general, the penetration by the dust is greater in fire-clay than in silica fire-brick. In most cases, the bond is attacked first, and coarser grains last. In silica bricks, the depth of penetration is generally less the finer the grain. In the fine-grained bricks, the coarser grains and the bond are both attacked; while in the coarse-grained bricks the bond alone is attacked to any serious extent. The bond of a silica brick, therefore, offers the feeblest resistance against a corrosive slag. The attack of the coarser grains of a silica fire-brick varies with the nature of the latter grains; the penetration of the rock fragments by the dust being greater than in the case of a compact rock made up of interlocking grains. Under oxidizing conditions, iron oxide does not corrode silica bricks to any noteworthy extent; but under reducing conditions ferrous silicate forms, and acts as a corrosive flux. Iron oxides generally corrode the fire-clay bricks more than the silica bricks. The dusts apparently exert an influence on the conversion of the quartz into the low specific gravity form or forms, even where the coarse grains have apparently not been penetrated—probably owing partly to vapours of the alkalies in the dust.

A "Study of Silica Products," by Dr. A. Bigot, arrived too late to be included in the printed programme. It is a continuation of the work reported at the Sheffield meeting, and relates mainly to silica products used in the Siemens-Martin or similar furnaces. Particulars are given respecting the process of manufacture of silica products, and the application of tests for density, porosity, and crushing strength.

Dr. Mellor presented, on behalf of the Committee, a report on the Standardization of Tests for Refractory Materials (Part II.), which deals with the grading of clays, &c., according to the size of grain, and with the corrosive action of flue dusts on refractories. As regards the first, difficulties occur owing to the nature of clays, even if distilled water be used. It is not intended for use in works laboratories (and distilled water need not be employed here). As regards the corrosive action of flue dusts, no particular standard can be devised, though useful results can be obtained by using the furnace that was described in the paper by Dr. Mellor and Mr. Emery.

In a paper by Mr. H. C. Meyer, on "Zirconia," particulars are given of the occurrence, properties, and possible commercial uses of this remarkable substance. "Refractories in the Zinc Industry" was the title of a paper by Mr. J. A. Audley, dealing chiefly with the changes which take place during the extraction process, and including suggestions as to possible improvements.

Mr. W. J. Jones, the Deputy-Controller of Iron and Steel Production (Ministry of Munitions), in the course of a speech, stated that the monthly output of Welsh silica bricks (reckoned as 2½ in. square) was 2,155,000 in July, 1916, and in November, 1917, had increased by more than 75 p.ct. to 3,780,000.

The Consumption of Gas in German Towns.

According to the number for Aug. 19 last of the "Journal für Gasbeleuchtung," the consumption of gas per head in German towns increases with the population. This is shown in the article in tabulated form, from which it appears also that the consumption per head of the population steadily increased from 1902-03 to 1916-17. Thus in towns having a population exceeding 500,000, the increase was from 89 to 128 cb.m. In smaller towns under 500,000 and over 100,000, from 73 to 104 cb.m.; under 100,000 and over 50,000, from 62 to 93 cb.m.; under 50,000 and over 10,000, from 54 to 77 cb.m.; and under 10,000 and over 2000, from 46 to 76 cb.m. Since the dates referred to, restrictions on the use of gas have been imposed. In the large towns the length of pipes in the whole network is about 1 kilometre per thousand of the inhabitants. In small towns, twice this length is required. There is some compensation in the case of the smaller towns in the smaller diameter of the pipes required; but the advantage is still on the side of the larger towns.

Water-Gas Tar for Fishing Nets.—The Standard Gas Company, of Atlantic Highlands (N.J.), are selling their water-gas tar to fishermen along the coast to prevent their nets from rotting; and for this purpose it is said to have no equal. The nets are rolled and dipped in the tar, which is melted in cauldrons. Then the nets are pulled up an inclined plane of grooved galvanized iron sheeting, so that the surplus tar drains into the cauldrons.

NOTES ON GAS-FIRING BOILERS.

By T. M. HUNTER.

[Abstracted from the Proceedings of the South Wales Institute of Engineers.]

Gas is an ideal boiler fuel. The capital cost of an installation of gas-burners is small; and gas is simple to use when the principles of its use have been mastered. It is possible to maintain the boiler efficiency at a high level, if the fuel supply is regular and uniform; so that gas-firing ought to show in every case a higher efficiency than coal-firing. When using softened water and cleaned gas, the boiler should always work in its most efficient state. The economizer can be enclosed in an air-tight case; and thus all the cold air leakages are avoided. Gas makes the separately-fired superheater a most convenient arrangement. This is an important matter in connection with one modern development of the steam-turbine, which calls for reheating the steam after it has passed through one or more of the elements.

The defects of industrial gas, as a fuel, are that its pressure and composition are liable to variations, and that, in the case of most blast-furnace gas in this country, it is heavily laden with dust. Using gas varying in pressure and calorific value, it is difficult to set the combustion arrangements so as always to burn the gas at the highest efficiency. Even on the most modern installations, it is in practice found necessary to burn the gas, in its average state, with 20 p.ct. excess of air, not because perfect combustion cannot take place with less air, but simply to avoid the serious loss caused by unburned carbon monoxide in the waste gases, when the gas pressure or calorific value increases. Dust in gas fuel is a serious evil. It gets on the boiler tubes and flue walls, and very quickly reduces the efficiency, if allowed to accumulate. In water-tube boilers, in which the tubes can be cleaned while the boiler is running, it is quite a question whether cleaning the dust out of gas will pay; but with Lancashire boilers, which can only be cleaned periodically, cleaning the gas will surely pay.

In 1915, one of the officials of the United States Steel Trust stated that they had made tests, and found that, over all their plants, the average boiler efficiency of their water-tube boilers, fired with uncleaned blast-furnace gas, was 55 p.ct. Their experiments made with various forms of burners showed them that they could easily improve this average to 65 p.ct., but that it was doubtful whether they could maintain 70 p.ct. efficiency for very long at any of their plants, under ordinary working conditions. Water vapour in the gas, in any quantity, has a serious effect on the efficiency of combustion. It lowers the flame-temperature, and increases the amount of heat carried away to the chimney by the waste gases. Such moisture should, wherever possible, be eliminated by cooling the gas to 30° C., or lower.

The losses due to the admission to the boiler of any air in excess of the minimum amount required for the combustion of the gas, are the most serious losses in the firing of boilers with gas. Whether the air is admitted through the burners or finds its way in through the boiler-setting is of little consequence. In practice, the theoretical flame-temperatures are never reached. The ignition temperature of the gases with which we are dealing is about 600° C.; and consequently, if we use any large excess of air for combustion, we soon approach near enough to this temperature with our flame-temperature to make complete combustion in the vicinity of the boiler-tubes almost an impossibility. For these reasons, we are led to conclude that the scientific method to follow in burning gas is to use an arrangement or burner which gives us complete control over the conditions of combustion; for then only shall we be able to reproduce the conditions of maximum efficiency.

The huge losses involved in boiler firing by gas are not realized. The ordinary efficiency of gas-fired boilers, under present conditions, is from 50 to 60 p.ct.; and many boilers fired with blast-furnace gas work at an efficiency as low as 30 p.ct. Figures have been obtained by careful testing, using a gas-meter or gasholder, which show the following results: 83 p.ct. efficiency for a water-tube boiler with superheater, but without economizer, fired with coke-oven gas; 80 p.ct. for a Lancashire type boiler, with both superheater and economizer, fired with clean blast-furnace gas; 79 p.ct. for a Lancashire boiler, with both superheater and economizer, fired by producer gas; 65 to 67 p.ct. for many tests on water-tube boilers, without superheaters or economizers, fired with uncleaned blast-furnace gas. The difference between these figures, in the case of one boiler, is sufficiently startling. In the case of a small iron-works, where 100,000 lbs. of steam are raised per hour by gas, the cost of the steam, if it were raised by coal, would be about £40,000 per annum. A saving of 25 p.ct. in efficiency means a saving of £10,000 per annum.

The essentials for the economical combustion of gas are that the gas should burn immediately and completely, at the highest flame-temperature, and with the smallest excess of air. America and the Continental countries are far ahead of us in gas-firing matters. They have long ago proved that the best combustion takes place when gas and air are intimately mixed before combustion begins. For this reason, one or other variation of the bunsen burner is almost universally fitted in modern foreign works. In this country there is not so far one such installation; indeed, the pre-heating of air for the combustion of gas has hardly been considered here. The usual method of burning gas in this country is

to admit the air and gas by ports in the boiler-front, with or without external combustion chambers, and to let them mix while combustion is taking place. In these circumstances, the flame-temperature never rises to anywhere near the possible figure, the flame is long, combustion is slow, and in many cases is still going on in the chimney. Using modern burners with gas or air under pressure, far more gas can be burned in the boiler than is possible by the older method; while at the same time the efficiency is raised. If high boiler outputs are required, a high pressure of air or gas will give a short intense flame; and the boiler output will only be limited by the volume of waste gases with which the boiler-flues can deal.

To attain an intimate mixture, either the gas or the air must be under a pressure, which should not be less than 2 in. water gauge; or induced draught may be used. It is preferable, unless the boiler brickwork is enclosed in sheet steel, to use gas or air under pressure, or both, at the burners. By doing this, serious leakage of air into the boiler through the brickwork, often through invisible cracks, is avoided, as the whole of the boiler can be kept under very slight pressure and the combustion products simply drawn away from the damper by the chimney draught.

The subject of the transfer of heat from hot gases to the water in the boiler is of great interest to anyone who tries to design a boiler specially for gas-firing. Most of the heat must be transferred from the gas by actual contact between the gas and the tubes. It is found that by far the greatest part of the resistance to this transfer of heat occurs at the surface, where the gases touch the tubes. The resistance to transfer through the metal, and from metal to water, is almost negligible in comparison. The reason seems to be that a very thin film of cooled gas sticks to the boiler-tubes, and prevents the contact of hot gases with the tubes. There are two ways to get over this. Either the surface of the tubes in contact with the gases may be greatly increased in relation to the wetted surface of the tubes, as is done by the use of corrugated flues or ribbed tubes, or by using small-tube water-tube boilers like the Yarrow boiler; or the gases may be caused mechanically to scour the surface of the tubes, sweeping away this layer of cooled gas, and making close contact all the time between the hot gases and the tubes. This can be done by applying considerable power to the gases in the way of forced draught or suction, as in the Bonecourt boiler, where, in addition to the gas pressure available, suctions of as much as 16 in. water-gauge are employed, and the transfer of heat through the fire-tubes is enormously increased. It is claimed that evaporations of 30 lbs. per square foot of heating surface per hour can be got continuously, and that the whole of the combustion takes place in the first 2 ft. of a 15-ft. boiler tube. The transfer of heat through this part of the fire must therefore be enormous. The author would not like to be near one of these boilers should any trace of oil get into the feed water.

Similar results, with a much more reasonable temperature gradient through the length of the fire-tubes could be attained by the use of suitably designed boilers, with much smaller suctions than 16 in. water-gauge. The Lancashire boilers made thirty years ago, with a tube-plate about 20 ft. from the front, and small fire tubes running from it to the back of the boiler, would make excellent boilers for gas-firing, provided we were prepared to use induced draught, and to treat them as internally fired only, giving up the outside heating surface. Only the smallest suctions can be applied to boilers with brick settings, owing to air leaking in through the walls. If, however, we caused the gas to burn completely in the wide flues, and then drew the products rapidly through the small fire-tubes, we should get an adequate duty from the boiler, at a high efficiency, and we should cut out all the loss by air leakage and much of the loss by radiation, which are so serious in the Lancashire boiler as usually fired. The marine type of Scottish boiler, with two or more flues, would be even more suitable for this treatment; and the author expects soon to see boilers of this type used for gas-firing. He believes that this boiler would beat the best water-tube boiler in efficiency. The provision of pre-heated air for combustion is even more important when using gas than when using coal fuel.

The author has twice come across cases where it was stated that gas-firing was responsible for damage to the boiler-tubes. He has had experience of boilers, fired for many years with Mond gas, which show absolutely no damage at all. If gas is burned with a small excess of air, so that there is a minimum of oxygen in the burned gases, and if combustion takes place quickly, so that it is practically complete before the gases touch the boiler-tubes, no damage whatever can occur to the tubes. In firing water-tube boilers, he always likes to arrange the gas-burner pointing towards the floor, at an angle of (say) 20° below the horizontal, so that the gases may be completely burned before rising to the tubes. This has the further advantage that the brickwork of the boiler, on which the flames play, is kept very hot, and assists in the rapid combustion of the gas. In the case of uncleaned blast-furnace gas, the flame-temperature is so high, by this method, when burning the gas with a small excess of air, that much of the dust can be melted, and thus thrown out of the products of combustion, instead of being burned on to the tubes.

The will of the late Mr. Daniel M. Fox, M.Inst.C.E., for many years Chairman of the San Paulo Gas Company, who died on Aug. 13, aged 88, has been proved at £107,376, with net personalty of £104,975.

AMERICAN ILLUMINATING ENGINEERING SOCIETY.

The Annual Convention of the Society was arranged to be held in the Engineering Societies' Building in New York City on the 10th inst.—the entire technical programme being confined to one day, instead of four days as was the custom before the war. All presentations and discussions were therefore to be in condensed form. The evening was given over to a dinner-meeting, at which speakers of national prominence were to discuss questions pertaining to the war and illumination. The tentative programme for the day session included the following items:

Morning Session—9.30 a.m.

Presidential Address of Mr. G. H. Stickney.
Report of the Committee on Progress, introduced by Mr. F. E. Cady.
Report of the Committee on Nomenclature and Standards, by Mr. A. E. Kennelly.
Statement on behalf of the U.S. National Committee of the International Commission on Illumination, by Mr. E. P. Hyde.
Report of the Committee on Lighting Legislation, and a Statement concerning the Work of the Divisional Lighting Committee, by Mr. L. B. Marks.

Afternoon Session—2 p.m.

Lighting of Cantonments, introduced by Mr. Bassett Jones.
War-Time Lighting Economies, by the Commissioner on War Service.
Light as a Manufacturing Stimulant, by Mr. W. A. Durgin.
Protective Lighting, by Mr. Edmund Leigh.
Influence of Lighting Curtailment upon Accident Hazards, by Mr. R. E. Simpson.

The third of a series of popular lectures prepared under the auspices of a Committee of the Society is now ready. It is entitled "Protective Lighting," and treats of the use of light as a means of defence against damage to the industrial and military machinery of the country, resulting from sabotage and acts of enemy agents in general.

Coke-Handling Plant at Manchester.

The coke-handling plant on the "Ideal" system, installed by Messrs. Drakes Limited, of Halifax, at the Bradford Road Gas-Works of the Manchester Corporation, has been described, along with a number of illustrations, by Mr. G. F. Zimmer, in the pages of "Engineering." The machine is mounted on a bogie running on rails in front of the retort-bench, and is similar to an inclined elevator with one large bucket, or, in other words, is like a skip hoist used for boiler-house refuse, which is similar to coke in its destructive nature. The coke is delivered by a steel-cased multiple shoot (attached to the travelling carriage of the machine) into the skip from the various tiers of retorts. The vanes of the shoot project slightly beyond the mouthpieces of the retorts, so that the whole of the coke passes into the skip without any spilling. A retort of a higher tier does not mean a greater fall for the coke, as the skip is raised farther up the incline to receive its load. The position of the skip is so arranged that the coke is received with a minimum of fall, thus obviating the formation of breeze. The skip travels on four wheels on double tracks; and the divergence of the lower one, upon which the forward wheels travel, causes it, when it reaches the top of the incline, to slowly tilt, so that the coke is discharged gently into a fixed shoot in the retort-house wall prepared to receive it. Down this the coke slides on to the quenching-bench outside the retort-house, where it is spread in an even layer, and quenched with a minimum of trouble. Instances of insufficiently quenched coke are said to be altogether unknown. There are two totally enclosed dust-proof electric motors—one for travelling, and the other for hoisting. An adjustable platform is provided for the attendant, for the purpose of opening and closing the mouthpieces on the retorts of the upper tiers. The coke-skip in this installation is 7 ft. long and 5 ft. wide, and of a capacity to receive the contents of one retort 24 in. by 18 in. by 22 ft. The original skip fixed in December, 1916, has been continuously at work ever since, without needing any repair. Where ordinary coke is desired without screening, it can be delivered as desired direct from the quenching-bench into carts, thus avoiding handling in other directions. The actual time taken in discharging a retort of the size just mentioned, and depositing the coke on the quenching-bench, is 35 seconds; and in another 10 seconds the skip is again in position to take the next retort. Mr. J. R. Hill, the Manager of the works, has supplied the author with figures which show that the expense of getting the coke out of the retort-house is, for manual labour, and not including driving power, repairs, and capital expenses, 2·4d. per ton.

Fuel Economy in the United States.—An article by Mr. D. Brownlie, B.Sc., F.C.S., on "Fuel Economy in the United States," has been reprinted from "Engineering." It should be useful to have it in this convenient form for reference, as the article deals with the steps now being taken by the United States Government to effect coal economy, and also with the question of the instruments useful and desirable in the boiler-house as an aid to the same end.

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SCOTTISH JUNIOR GAS ASSOCIATION.

(EASTERN DISTRICT.)

Opening of the Fifteenth Session.

The Opening Meeting of the Fifteenth Session of the Scottish Junior Gas Association (Eastern District) was held in the Heriot-Watt College, Edinburgh, last Saturday, when an address was delivered by Mr. James Dickson, of Johnstone, on "Gas Economies, with Special Regard to Carbonization and the Treatment and Disposal of Residual Products."

Mr. R. WADDELL (Polmont), the new President, thanked the members for the honour conferred upon him. Mr. J. J. Scott, of Lower Largo, who has been President for the past three years, also expressed his indebtedness to the members for the support extended to him during his occupancy of the chair.

The PRESIDENT, in introducing the lecturer, said that Mr. Dickson had been instrumental in the formation of the Scottish Junior Gas Association, and did much to set it on a sure foundation. Since then he had proved himself to be one of the most progressive gas managers in Scotland.

Mr. DICKSON then proceeded with his address on

GAS ECONOMIES, WITH SPECIAL REGARD TO CARBONIZATION AND THE TREATMENT AND DISPOSAL OF RESIDUAL PRODUCTS.

We are often told of what great service our industry is to the State in the prosecution of the war. In that wonderful Presidential Address of Lord Moulton at the June meeting of the Institution of Gas Engineers appear these words: "The successful methods still remain those which practical experience has discovered." He was speaking from his knowledge of the past few years of the promise of something priceless often held out to him by the use of some special method of carbonization, yet, in the end, the results were obtained by means not primarily intended for the production of the particular results desired. To-day gas works practice is following somewhat on the lines of the Scottish oil-works about the years 1880 to 1883. It was in 1881 that Messrs. Beilby and Young constructed retorts whereby the shale distilled first at a low temperature was afterwards subjected to increased temperature after the bulk of the volatile matter had been removed, and where the admission of steam resulted in a larger amount of gas and a higher yield of ammonia being obtained. Those men, striving after ammonia, found an increase of gas, ammonia, and tar.

Again, turn to the present method of stripping the gas of its benzene vapours by means of tar or oil passed through the washers. This also had its origin in the research work of the late Mr. William Young, who passed coal gas over tar from which the light naphtha had been extracted, and found the illuminating power reduced by the re-absorption of the naphtha by the tar from the gas. This discovery led him later to apply the converse method, by passing an intermediate oil through the scrubbers and recovering a large proportion of light oil from the gas in the shale-oil plants that would otherwise have been wasted. Thirty-seven years later, we are seriously thinking there is some meaning in this for us.

SOME ASPECTS OF CARBONIZATION.

I desire to confine my remarks to practical comments on some aspects of the carbonization of coal and the application of methods that will appeal to those engaged in the medium-sized works from which the Association draws its members. It has been truly said that the two greatest elements in trade are quality of goods and excellence of service. Here we are in difficulties to-day. We are asked for service in one form from the State; and in carrying out these requests we are in return not treated too generously by our consumers. Meanwhile, the State is complimenting us, yet not showing overmuch consideration either. This anomaly cannot long continue. The needs of the State and the needs of our public must be supplied without so much conflicting divergence of ideas, methods, and processes. Public need cannot in all cases be fully met meantime; but we must find the time and the courage to sit down and think, take stock, look ahead, and see where all this is tending. The field of work which coal carbonization offers is illimitable. We in our various ways can help. We have daily opportunities of watching, working, and improving, and can make the most of these.

The gas made per ton of coal carbonized with Scotch coal has invariably in the past been under English practice for well-known reasons; but to-day, 14,000 to 16,000 c.ft. of from 450 to 470 B.Th.U. oil-washed gas is being obtained. These results are obtained in vertical retorts with the aid of steam and a proportion of the carbon of the coke converted into heating gas. Steaming the charge would also seem to be a success in horizontal retort working. But it is meantime difficult to see how results can yet compare with vertical retort practice, where each charge of coal is continuously acted on by steam from its moment of incoming to its exit from the retort as coke. Spare retorts would seem to be necessary to get the full advantage in horizontal retort working, and the steaming should be carried out in good retorts; otherwise the effect is neutralized by its action on the carbon, making the retort faulty for coal charging. The latter objection also applies to vertical retorting.

Some prefer to steam one horizontal retort in six continuously, changing the particular retort every four hours; while others have increased this proportion, and steam the centre retorts in an oven of six for some seven hours after a five-hour coal charge has been worked off. Increased makes up to 3000 c.ft. are being obtained; and it would also appear that a maximum period of seven hours' steaming of the coke is laid down, as a difference in heating value is seen in the producers when this is exceeded. Discouraging results have been met with by some; and the filling up of liquor wells with distilled water sounds very ominous. Excessive steaming is, of course, worse than none at all—simply putting back the heat of the setting. But some simple matter of detail has been overlooked when the above result is forthcoming. The essential thing is to get the correct quantity of steam through a heavy and incandescent body of fuel.

Attempts are also being made to convert vertical boilers into gas producers; and the results of this method will be awaited with interest. There would seem, in the generation of gas by means of a producer, more permanent hope of being able to treat a larger proportion of coke to the action of the steam in the smaller works, and still be able to supply a mixed gas of good heating qualities. In any case it is clear that many minds are working on different lines, but with one common endeavour—towards saving every possible pound of coal mined. A rough estimate of an increased yield of 2000 c.ft. of gas per ton would bring the total saving of the United Kingdom, in the gas industry alone, to about 3 million tons per annum.

TESTING GAS AS MADE.

Many of you in the smaller works probably have no photometer; but you need never purchase one now. Few have a calorimeter; and probably not one in ten has gas analysis apparatus. The jet photometer remains in too many cases the gas-maker's guide, philosopher, and friend. To-day, I believe it would pay handsomely the managers of all works to have a calorimeter and gas analysis apparatus. The latter will probably cost least and tell most. Not one of us can speak of inert constituents in gas until he knows his own. We may be manufacturing a comparatively high illuminating or calorific power gas, yet with a larger proportion of inerts than some so-called lower-grade quality, and making this at extravagant cost. The writer supplies a gas made in vertical retorts of the continuous intermittent type fitted with steam connection at the top of the coke chambers, just beneath the bottom brickwork of the retort; and the gas made per ton for the four-and-a-half months ended September has been 16,193 c.ft., of an average calorific power between 450 and 460 B.Th.U. after oil washing. The present capacity of the retort-bench is 60 p.ct. above the guaranteed capacity when erected five years ago. An average of 24 samples showed the following constituents:

	Per Cent.
Hydrogen	50·8
Methane	19·7
Unsaturated hydrocarbons	2·2
Carbon monoxide	14·1
Oxygen	0·8
Carbon dioxide	5·6
Nitrogen	6·8
	100·0

It is not possible to obtain a truly steady grade of gas, with all the watching one can give, with varying classes of coal passing through the retorts. In vertical retort practice, coal giving a hard coke may be undergoing carbonization. This necessitates greater steam volume, and is generally accompanied by higher carbon dioxide content; while coal of a softer nature coming immediately afterwards brings about a gradual decrease, and in its later passage through the retort favours the easier transmission of heat to the core, and a more suitable temperature for a higher carbon monoxide content. Percentages of this gas, ranging from 14 to as high as 17, have been obtained with a prolonged run of treble nuts, and a four-hour and 48 minute duration charge. The methane and olefines are reduced, the hydrogen increased, and the carbon dioxide content falls to between 3 and 4 p.ct. This leads one to emphasize the point that the size of the coal being used has an important bearing upon the latter constituent; and the writer's experience would induce him to advise those who are undertaking the steaming of horizontals to give this matter of carbon dioxide their first attention. The steam, in addition to its chemical action, exerts a pushing action on the stream of gas, and hastens its exit from the retort. The lower boiling point hydrocarbons are driven off quickly, and the carbonization of the mass will proceed with zero pressure in the retort if the exhausting arrangements are well controlled and the off-take pipes adequate. The coal passes the "sticky" stage sooner with steaming; and in the later stages the last remains of volatile matter are sought out in a way that can best be realized by those having the good fortune to apply this ready means of increasing the yield per unit of plant employed.

If the steam be shut-off at the bottom, and the poking ball on the top turned over hole upwards, a slight puff of pressure and pull alternately is seen. Open the steam-out, and pressure sets in immediately till taken up by the exhauster regulator. I should counsel care being taken in thoroughly claying round the mouthpieces of retorts, and the bottom doors in vertical retorts must be kept tight. A leaky retort should be let down as soon as possible after coal gas appears in the flue, unless this occurs during a period of low heats, in which case it will probably take up with increase in temperature. If attention is given to these matters, and only sufficient vacuum be kept on the bench to withdraw the

coal gas with a minimum of pressure inside the retort, and the steaming arrangements are conducted with an eye to the class of coal passing and the temperature of the retorts (the whole being checked by periodic tests of the quality of the gas), this will be such as will give speedy and economical work in all the uses to which it is now being put.

The calorimeter and recording instruments should be situated on the inlet side of the holders, with the necessary connection laid on from the outlet side, so that the figures can be readily checked. One may obtain a comparatively straight line on the outlet chart which has been somewhat jagged on the inlet side; but with the hour-by-hour check on the gas before storage all goes to the reduction of manufacturing costs. With the recording instrument on the outlet, it may be noticed one morning that the gas tests 20 B.Th.U. over what is necessary for an efficient supply. This points to a much larger increase having been passed through the inlet from midnight onwards. The same would hold good with a lower quality than that intended, resulting in the gas stock being affected and a period of disturbance in the supply to the consumers setting in that would have been obviated, or at least shortened, with a recording check on the inlet of the holder.

It may be of interest to state, in passing, that we keep a jet photometer set at 4·5 in., equivalent to 450 B.Th.U., and find it works fairly accurately in accord with a calorgraph in the proportion of 1-10th in. to 10 B.Th.U. It certainly acts quicker than the recorder, and has been found a useful check on the working of this instrument, which has been calibrated by a "Total Heat" calorimeter.

After five years' experience of supplying town gas solely by means of vertical retorts, and working gradually from 18-candle power and 9500 c.ft. of 650 B.Th.U. gas, to a gas which does not cater for the flat-flame burner, it is my opinion that we are yet bound to go further. On account of the extraordinary shortage of coal, which is likely to last for a considerable time after peace has been declared, the opportunity presents itself for thought being given now to the much greater proportionate yield of gas that would yet result in lowering the standard from 450 to 400 B.Th.U. The consumer would obtain good service without further taxing the resources of gas undertakings; and the latter, in turn, would accomplish this with results of such a nature as would lower the price to the consumer. The undertaking supplying a high calorific power gas at the works governor, employing a large proportion of plant, coal, and labour in the process, and cutting-down pressure in an attempt to see things through during foggy winter days, is not giving so good service to the consumer as the undertaking supplying a low calorific value gas with reduced plant, labour, and coal charges, and giving, in the process, an adequate and constant supply at the outskirts of the district. It does not specially concern the consumer what is the calorific value per cubic foot of gas, if he cannot warm the house.

I do not see that the gain in results should belong especially to vertical retort practice, though from a labour-saving point of view this occupies an unassailable position. One must keep in mind the fact that vertical retorting was assisted by a lowering of the candle-power standard, and eventually was enormously benefited by the abolition of this, and the substitution of the calorific test. The whole of the prospects of retorting would seem to depend upon the restrictions that may be laid down as to the composition of the gas; and if these will enable horizontal work to increase the gas yield at the expense of the coke, and if 2000 c.ft. of gas can be sold for each 1 cwt. of coke previously retailed, then there are hopeful days in front of us.

COKE.

The quality of the coke required in the industrial world makes it incumbent upon us to see that the manufacturers' specifications are adhered to. Instances have come to light recently which point to the fact that coke is being bought on quite a different basis from any that previously prevailed. The variety of uses to which it is being put makes necessary, in calculating its effective value, a consideration of its moisture, ash, and sulphur content, its freedom from small, and its calorific value. A good market can always be found for a grey coke of high calorific value and low sulphur and moisture content; the sulphur being an important matter where the coke is used for domestic purposes, welding, case hardening, and other branches of industry where its action has a bad effect upon the class of work undertaken.

It may be interesting to have the following figures relative to two samples of coke from the same coal carbonized in horizontal and vertical retorts respectively.

	Fixed Carbon.	Volatile Matter.	Ash.	Sulphur.	Water.	Calorific Value. Calorimeter.	Calculated.
Horizontal	=75·55	0·73	6·09	1·44	16·19	13,300	13,100
Vertical	=89·12	0·53	6·42	0·51	3·42	13,600	13,420

The above sample of horizontal coke was very well carbonized, and probably the average percentage of volatile matter left in coke of this nature approximates twice the quantity in the sample.

Watch the fuel used in producers and boilers. It is difficult in these times, with coal delivered as now, to work with a 15 p.ct. fuel allowance and sell a dry coke. The average sale of coke per ton of coal carbonized is to-day, with horizontal retorts 9 cwt., and with vertical retorts 1½ to 2 cwt. less. The "Gas World Analyses of Accounts, 1916-17," gives an average sale of 7·4 cwt. for six works in Scotland using vertical retorts entirely. Twelve works using horizontals chiefly average 9·8 cwt.; so that, judging from practice, a difference of 2 cwt., as representing the difference in coke sales betweens the two systems, is not overstating the case. On submitting the figures to further analysis, it is seen that the total receipts show in favour of the vertical retorts; and the difference in the value per ton of coke sold is 2s. 6d. How much of this may be apportioned to the better quality of coke, the law of supply and demand acting on the smaller quantity available or to other causes, it is not possible to determine.

At one time low gas makes per ton and high coke sales from cheap coal gave the best economic return; but with present high prices of coal and labour, best working results are now obtained with high yields of gas, since modern carbonizing methods increase at the same time the liquid products. Coke saved will still further help figures; and the cost of steam raising can yet be materially reduced. Breeze furnaces, combined with water preheating arrangements and waste-heat economizers, will be more taken advantage of, and boiler evaporating capacities will be closely watched, now that each ton of coke and breeze has doubled in price. Low-grade coals of the duff variety, not suitable for carbonizing, may be used in gas-works boilers where the breeze made is not equal to the demand, thereby throwing an additional amount of coke upon the market.

A 30 ft. by 8 ft. Lancashire boiler, having an economizer and exhaust steam pre-heater with the entering steam brought up to a temperature over 300° Fahr., and fired with low-quality fuel, will evaporate approximately 9 lbs. of water per pound of coal burned. With induced draught and mechanical stoking, the writer lately saw a boiler of this type evaporating 10,000 lbs. of water per hour, the evaporative power of which, with hand firing, was 6000 lbs., and the boiler was burning 30 lbs. of dross of 11,000 B.Th.U. per pound per square foot of grate area per hour.

The Bonecourt gas-firing system is soon likely to occupy a prominent place in gas-works economics; but firing by gas, other than by close surface combustion, is likely to be costly unless carried out by surplus or bye-product gas of low calorific value which would otherwise have been wasted.

Vertical retorts with producers on a stage floor and regenerators underneath, extending to a total depth of 15 ft., could be turned to better use in the generation of steam by utilizing the heat of the waste gases for a very considerable portion of their travel. From experience, I am fully persuaded that the amount of travel sometimes given to the preheating of the secondary air is unnecessary, and leads more than anything to a danger of short-circuiting. In many cases the bottom half could with advantage be utilized for steam-raising and the top half only for recuperation.

AMMONIA.

Much has been written during the last two years on the production and conservation of ammonia; and the practical difficulties that lie in front of complete gasification of the coke by steam were pointed out by Prof. J. W. Cobb in his "William Young Memorial Lecture" to the North British Association of Gas Managers. These, as stated, were the large quantity of carbon dioxide that would be present in the gas if a low enough temperature for the conservation of ammonia was decided on, or if a high temperature, such as would keep the carbon dioxide content within reasonable limits, then ammonia would be destroyed. Beyond this, there was the problem of conveying through the walls of the retort "not the comparatively small quantity of heat required for carbonizing, but the comparatively enormous amount necessary to gasify completely the carbon by the water-gas reaction." Meantime, the middle course lies in steaming the charge and gasifying a proportion of the nitrogen of the coke, with the resultant gaseous atmosphere acting as an envelope for the conveyance of ammonia from the part of the carbonizing mass where it is formed. This may be in the low temperature of the partly carbonized mass or in the much hotter region when the last traces of volatile matter have been given off, and where the steam acts on a proportion of the nitrogen left in the coke.

To what extent it is possible to increase the ammonia is shown by the results returned by Mr. Lawrence Hislop, of Uddingston, during the month of October, 1917, as 52·34 lbs. of sulphate of ammonia (24·75 p.ct. ammonia) when making a non-luminous gas of an average calorific value varying from 450 to 460 B.Th.U. This is an extraordinary increase on past working practice in Scotland, which has averaged, with Fife coal, from 18 to 22 lbs., and in the West of Scotland from 25 to 32 lbs. Should these figures be secured within 80 p.ct. for twelve months' working, they represent an approach to the best oil-works practice, which may presently be taken as being equal to from 50 to 55 p.ct. of the total nitrogen in the shale, and a result in every way worthy of emulation.

Ammonia results have suffered where attempts have been made to comply with the needs of the Government for benzol in plant that was barely sufficient for the recovery of ammonia. But the responsible departments are giving heed to the shortcomings of plant in this direction; and considerate treatment is accordingly assured applications for priority. Since additional plant was laid down, a figure of 35 lbs. of sulphate of ammonia is being regularly obtained by the writer, and new liquor distillation plant will yet considerably enhance the result.

TAR AND BENZOL.

Many attempts have been made in the past to gasify tar, but with no great success. With its recent depressed price, minds were again turning in this direction; but now it seems to be clear

that the gas-makers' aim will be along the lines of obtaining the maximum yield of tar with a high yield of cheap heating gas. The attainment of this is so bound up with national interests as to dispel all thought of destructive distillation. Rather would it seem necessary for small and medium-sized undertakings to consider means whereby this valuable bye-products may bring to them something more clearly approaching its real value. For the purpose of delivering the tar in a prepared state for road making, and saving the cost of transport (in some cases 30 and 40 miles) to distillers, then back to the roads in the district where the tar was originally produced, plant can be erected at no inordinate expense which will give in the process either crude or refined oils. The simultaneous production of three or four products should be looked to, with the means for distilling to pitch.

Dehydration plants work-up the tar to a temperature of 240° to 260° C., according to the nature of the crude tar, at which temperature the product recovered from average vertical-retort tar (sp. gr. 1·080) is an oil varying in gravity from 1·000 to 1·010 and a prepared tar (gravity 1·180 or slightly over). This oil can be again distilled, and a naphtha (sp. gr. ·930) and light creosote (sp. gr. 1·020 to 1·040) recovered. This method is crude in so far that the products do not distil off simultaneously; but makers are now arranging that the above oils, and any others that may be desired, will be obtained in one operation. The addition of fractionating plant will also require to be considered if the best markets are to be obtained and held.

The varying characteristics of horizontal and vertical retort tar are now generally understood; and while the paraffin content of the latter was considered disadvantageous during the first three years of the war, the need for fuel oil has brought to light other qualities which it possesses viewed from this standpoint. As a rule, it will distil off 50 p.ct. light oil and 60 p.ct. more creosote, with little carbolic but more cresylic, than an average horizontal retort tar; while the pitch content is correspondingly reduced. The following results have been obtained from the treatment of twelve months' production of tar, amounting to 163,370 gallons.

Distillation Test of Crude Tar (Sharples, 1917).

Sp. gr. at 60° Fahr. = 1·080.

Water	=	6·77 p.ct.
Oil to 170° C.	=	9·28 ,,
,, 170° to 270 °C.	=	23·02 ,,
,, 270° to 315 °C.	=	9·86 ,,
Pitch	=	51·07 ,,
		100·00

The pitch contained 5·23 p.ct. of free carbon.

Crude Tar Treated.

	Gallons.
Crude naphtha, sp. gr. ·930 =	12,249
Light creosote, sp. gr. 1·020 =	36,089
Prepared tar, sp. gr. 1·160 =	103,880
Liquor, 5 oz. strength =	8,900
Distillation loss (by difference) =	2,252
	163,370

In working up such tar to temperatures of 235° C. and 260° C. (thermometer in tar), the prepared tar was found to contain 27·3, 23, and 17·2 p.ct. respectively of oil, and was really a soft pitch at the last temperature mentioned, yet contained only a fraction over 6 p.ct. of free carbon. The distillation pointed, therefore, to little destructive effect having obtained in the process. With horizontal retort tar varying in gravity, according to the conditions of carbonization, from 1·14 to in some cases as high as 1·20, with a free carbon content of 12 to 15 p.ct. and over, it would be unnecessary to work up even to the minimum temperature named above; and comparatively little oil can be recovered if a tar for road making is aimed at. In such a case it is preferable to distil to pitch.

The capacity of these plants is very high for the ground space occupied; and a 4000 gallon a day plant rated for horizontal retort tar will deal with half the amount of tar of a lower gravity from vertical retorts as it becomes necessary, in order to bring up the gravity, to work at a much higher temperature; and with certain grades of tar and a temperature of 260° C. the output of oil from the plant may exceed the amount of prepared tar.

The light creosote oil from the distillation plant is used for oil washing the gas for the recovery of benzol, and has proved in our case to give efficient results with no trouble from naphthalene deposits.

Benzol recovery from the benzolized oil may be undertaken intermittently by means of dehydration plant; but the writer discontinued this method in preference to continuous work with the oil running by gravity from the scrubber, through a preheater, to the still, thence to the debenzolized tank on the ground level, from which it is pumped for further circulation. A twenty-four hour run of this oil plant, with distillation tests of benzolized and debenzolized oil carried out every four hours, is given below. The benzol recovered had a specific gravity at 15·5° C. of ·873, distilling 71 p.ct. up to 160° C. (corrected).

Wash Oil Passing per Hour	Wash Oil per Ton of Coal.	Temperatures.					Average Distillation Tests of Oil.								Gas Passed Through Scrubber, Thousands Cubic Feet.	Coal Carbonized.	Benzol Recovered	Galls. per Ton of Coal.
							Benzolized Oil. Sp. gr. 1·016 at 15·5° C.				Debenzolized Oil. Sp. gr. 1·023 at 15·5° C.							
		Wash Oil Scrubber Inlet.	Gas Scrubber.	Air.	Oil at Outlet of Preheater.	Still at Top of Fractionating Column.	100° C.	145° C.	170° C.	190° C.	100° C	145° C.	170° C.	190° C.				
Galls.	Galls.															T. c.	Gallons.	
31·20	52	22·2° C.	21·1°C.	16·6° C.	65° C.	92° C.	·75%	2·75%	·10%	1·5%	*Nil.*	·25%	·75%	·50%	237	14 8	27·65	1·92

CONCLUSION.

In conclusion, I hope I have succeeded in touching to some extent on vital matters that lie to your hands as gas engineers. We are on the eve of keen competition from electricity, backed by strong Government support that will enable it to throw its embrace into districts hitherto considered outside its ken. We know its generation is carried out in what has been termed "shameless waste;" but the electrician at the other end of the line interests the public most. He carries service along with him, and imbues the desire to purchase. The public will pay for service. Let us therefore sell it, and, above all things, try to understand ourselves first before picking faults with the other fellow. Then we can go ahead and put our whole heart into work of such a nature as will overcome the strongest opposition.

APPRECIATIVE REMARKS AND A VOTE OF THANKS.

Mr. H. RULE (Kelty), in the course of an appreciative review of a number of points discussed by the lecturer, said that, although it was true inventors had worked in the dark, they would not have done so if there had been apparatus to help them. The very fact that a man who had a calorimeter could come out in the morning and test his information was a source of absolute confidence to him. As one of those who had invested in a calorimeter, he could thoroughly recommend it as an apparatus of very great value in gas-works. So far as gas analysis was concerned, a very simple apparatus was on the market for testing for CO_2 and oxygen; and if every gas manager had some apparatus of this kind, it would simplify a great many of the difficulties with which he was being confronted. Some of them might have been wondering why the liquor in the well was so weak. A knowledge of what was going on would clear this up. By testing, it could easily be ascertained how much CO_2 was being made. Mr. Dickson had also raised an interesting point regarding undertakings supplying high calorific power gas and cutting down pressure. High calorific value with low pressure meant that the gas was not being properly consumed, Regarding the comparative amount of moisture in horizontal and vertical coke, they should keep in mind that, while they had to make coke to help to cheapen the cost of their product, they were gas makers; and it was gas they wanted to sell. If they could make all gas, and thereby make it cheaper, they should not really consider themselves as coke makers. He quite agreed with Mr. Dickson's remarks regarding the "shameless waste" in the generation of electricity. It seemed to him that the more gas they could make out of a ton of coal the better case would they have to put before the Coal Controller. They were getting no credit for the amount of coke they were making. The public, as had been said, would pay for services. He did not pretend to sell cheap gas. But he had a woman going round cleaning burners, &c., and inquiring if there were any complaints; and this had paid his Company. Did Mr. Dickson think it would not pay a gas-works of about 30 millions to instal plant for making tar for road making? This was an important point.

The PRESIDENT said that Mr. Dickson had referred to the fact that gas-works practice was following somewhat on the lines of the Scottish oil-works about 1880-83; and no doubt to-day they were much indebted to the pioneer work of Messrs. Beilby and Young. The old and obsolete standard of illuminating power had passed away; and this had in no small measure paved the way for improvements in the method of carbonizing coal in gas-works. The present crisis in the matter of coal supplies had led many of them to try steaming in horizontals; and from records of results published in the Technical Press, the experiment had justified itself. It was essential, however, in this matter to steer clear of the old rule-of-thumb method of judging the quality of gas. Analysis of mixed gases must be made, so that the percentage of inert matter in the gas supplied might be kept down to the lowest possible point. Mr. Dickson had also brought to their notice some very interesting figures in regard to tar dehydration and the recovery of benzol. There was no doubt that, in the near future, many gas-works would instal plant to deal with the more valuable of the bye-products.

Mr. DICKSON, who was accorded a hearty vote of thanks for his valuable and interesting address, said, in reply to Mr. Rule, that he certainly thought it would pay to instal a dehydration plant.

Midland Junior Gas Association.—The first general meeting of the new session will be held at the Council House, Birmingham, on Thursday of this week. Mr. T. H. Poulson, of Stafford, will deliver his Inaugural Address.

Swinton and Mexborough Maximum Price Order.—The Local Government Board have made an Order under the Statutory Undertakings (Temporary Increase of Charges) Act, authorizing the Swinton and Mexborough Gas Board to increase their maximum price (on the same conditions as contained in preceding Orders) from 5s. to 6s. per 1000 c.ft.

BRITISH COMMERCIAL GAS ASSOCIATION.

SEVENTH ANNUAL GENERAL MEETING.

The Seventh Annual General Meeting of the Association was held last Wednesday afternoon, in the Hall of the Royal Society of Arts, John Street, Adelphi, under the presidency of Sir Hallewell Rogers, the Chairman of the Birmingham Corporation Gas Department. There were with him upon the platform the Right Hon. Lord Moulton, K.C.B., G.B.E., F.R.S., Director-General of Explosives Supplies in the Ministry of Munitions (the President-Elect), Sir Dugald Clerk, D.Sc., Mr. Samuel Glover (President of the Institution of Gas Engineers), and Mr. F. W. Goodenough, the Chairman of the Executive Committee of the Association).

On the opening of the proceedings, the minutes of the last annual meeting were taken as read; and the Acting Secretary (Mr. J. C. Walker) read apologies for absence from the Lord Provost of Glasgow, the Lord Provost of Edinburgh, Sir Robert Hadfield, Mr. Thomas Waddom, of Newcastle, Mr. H. Wade Deacon, of Liverpool, Mr. John E. Cowen, of Newcastle-upon-Tyne, Alderman W. Penrose-Green, of Leeds, Councillor G. E. Hilton, of Leicester, Colonel H. K. Stephenson of Sheffield, Councilor W. Clark, of Doncaster, Alderman J. W. Newbold, of Derby, Mr. Thomas Canning, of Newport (Mon.), and Mr. C. E. Dovey, of Cardiff. In his letter, Mr. Waddom said: "I deeply appreciate the value of the good work done by our retiring President during the difficult and trying period in which he has held the office, and the willing devotion by him of his valuable time to the furtherance of the interests of the Association."

ADDRESS BY THE PRESIDENT.

The President then proceeded to read the following address.

I regret that another year finds us still unable to hold our annual meeting and conference on a peace-time basis, and that the continuance of war again prevents my welcoming you to Birmingham, where I hope the Association will hold its annual conference after peace has been declared. Fortunately, we appear to be much nearer that time than a few months ago seemed possible; and although we must beware of shouting before we are out of the wood, we can to-day—thanks to the protection of our Fleet, the gallantry of the Allied Armies, and the genius of their great leader, Marshal Foch, ably seconded by the indomitable head of our own forces, Field-Marshal Haig—clearly see the light beyond the trees.

The Industry's Work in the War.

The time is not yet come when the full story can be told of the part the gas industry has played in, first, staying the onrush of the enemy and, finally, in flinging him back in defeat. But no review, however brief, of the period during which I have occupied this chair, could omit some reference to the national importance of the industry in these historic years. Lord Moulton, to whom I am proud to hand on the office of President, will, let us hope, be free in twelve months' time to tell you more than I can or may of what the industry has done for the Explosives Department of the Ministry of Munitions, which he has administered with such signal ability and success. But it can at least be said now that the gas-works of the country have from the very commencement of the war been of assistance to the Government in this and in other directions in a measure that has found very faint reflection in the assistance the Government has seen fit to accord the industry in its struggles with an ever-growing burden of difficulties.

Apart from its prompt action in meeting the need for explosives in the early days of the war, and of its readiness in most cases to go to the extreme limit in the release of men for the fighting forces and of experts for the laboratories, the industry has done invaluable work in the quick improvisation of depôts, canteens, hospitals, and other establishments for the militant army, and of factories and workshops for the industrial army. It has set itself to providing fuel oil for the navy; it has furnished the farmer with indispensable fertilizers at prices far below their market value; it has been an important source of ammonia supply; and, last but not least, it has furnished enormous supplies of gaseous fuel to munition works of all kinds, as well as in increasing quantities to all branches of industry and to the homes of the people—supplies of a fuel whose use saves labour, increases output, and entails a smaller destruction of raw coal than if the coal were employed in crude form to do the same amount of useful work. This it has accomplished in the face of ever-increasing difficulties—as to supplies of materials, as to labour, and as to finance—which have culminated to-day in the prospect of reduced turnover, and consequent increased cost per 1000 c.ft. of manufacture, as a result of a shortage of coal.

Birmingham's Share.

We had the opportunity in Birmingham on the occasion of our "Win the War Day" of demonstrating to the public the large amount of work that was being done by the Birmingham gas undertaking in connection with the war. For instance, we told them—through the medium of notices posted-up on motor lorries containing the representative women workers in the Gas Department—

> That fourteen thousand million cubic feet of gas had been used in Birmingham for the manufacture of munitions during the war.
>
> That the raw material for explosives extracted from Birmingham gas since the outbreak of war was equivalent to 9000 tons of T.N.T., lyddite, &c.—sufficient to fill 25 million 18-pounder high-explosive shells.
>
> That the gas was essential for the production of aeroplanes, tanks, guns of all descriptions, shells, armoured cars, transport wagons, munitions of all kinds, trench mortars, hand grenades, torpedoes, mines, and a thousand-and-one other implements of war; and that our artillery and airmen were dependent on the gas-works of the country for the supply of high explosives for their shells and bombs.
>
> And that, in addition, the food production has been helped by several thousand tons of sulphate of ammonia manufactured at our works.

The Birmingham public had never before realized the activities of the gas industry; and since our demonstration was given, I have heard on all hands expressions of astonishment and appreciation of what is being done.

The Rationing Order.—Government Attitude.

The Household Fuel Order is a complicated and troublesome business; and I do not propose to discuss its principles or its details here. But I do wish to say emphatically to the Government for the industry—not, however, for the benefit of the industry, but on national grounds—that it is their bounden duty, in administering the Order, to do everything necessary to prevent a single ton of coal being burnt in crude form that could be carbonized at a gas-works, and to prevent a single unit of electrical energy from being used as a heating or a cooking agent in any part of the country. The Government is too fond of compromise where there are rival trade interests affected. The Fuel Order is a flagrant case of such compromise; and the fact needs to be stated plainly.

Organization.

In this, as in many other instances during the war, the gas industry has been treated by the Government as the Cinderella of public supply undertakings. But have we not had ourselves somewhat to blame for this position, through want of organization and unity in the industry itself? I do not think anyone will dispute this fact. And I, for one, welcomed cordially from its inception the advent of the National Gas Council as an important, though obviously only an interim, step towards complete organization and unity. I welcome still more gladly the action now being taken to extend the functions, and broaden the base, of that Council; and I deprecate very strongly the attempt that is being made to split the industry from top to bottom by separating the municipal from the company owned undertakings. If this war has any lesson for the industry, surely it is to be found in the imperative need for unity; and I most earnestly appeal to all who have its best interests at heart to drop all idea of separation, and join together for mutual help and common progress. It is the spirit of unity, of common effort for the common good, that has attracted me from the outset to the work of this Association; and it is to the broadness of its constitution and of its policy that I attribute much of its striking success.

After-War Campaign.

Most individual gas undertakings, and to a large extent the British Commercial Gas Association itself, have had to close-down their ordinary propaganda work during the war; for we have all, owing to various causes—namely, shortage of labour, shortage of coal and gas oil, and the largely increased demand for munition purposes—found it extremely difficult to meet the needs of our consumers. But in the period of reconstruction after the war, we shall need the utmost activity in bringing before the public the many advantages to be gained by the use of gas. And here our war-time experience in connection with the use of gas for so many industrial purposes has opened out before us a very wide field for our activities in this direction. Even the Household Fuel and Lighting Order will not have been an unmixed blessing, as it has caused a

large number of consumers to realize, as never before, how dependent they are upon gas apparatus. The shortage of fuel will also have served to emphasize the value of coke. And here I would reiterate my advice to the industry to pay more attention in the future to the quality and the grading of the coke they offer for sale; and then to organize and push the sale on sound commercial lines. I know our Chairman and his staff have collected a large amount of data and ammunition for an "After-War Campaign;" and the work of the Association should be of incalculable benefit to the whole gas industry.

The Association has, however, I can testify, "carried on" during all the difficulties of the war with very considerable advantage to the industry, always adjusting its activities to the needs of the nation and the industry at the moment; and the existence of its organization, backed by funds, has been a source of strength and support very widely appreciated. Apart from its own activities, the financial backing accorded to it by the great majority of gas undertakings has enabled it, as a temporary expedient pending more satisfactory arrangements, to provide the wherewithal for the research work of the Institution of Gas Engineers, on the one hand, and for the defensive and unifying work of the National Gas Council, on the other. I am glad that steps are being taken, in connection with its re-constitution, with a view to direct financial support for the National Gas Council, as, apart from the inappropriateness of one of the constituent bodies finding most of the money required by the head organization, the British Commercial Gas Association will require in the future all the income it can obtain from its basis rate of subscription for the prosecution of its proper work of keeping the case of gas constantly to the fore, and educating the public in the advantages accruing from its extended use, alike to the individual consumer and to the community.

Publicity an Investment.

The communal and national aspects of the extended use of gaseous fuel—the abolition or diminution of the smoke nuisance and the consequent increased sunshine and improved atmosphere in our cities; the saving of labour, alike in factory and in home; the better conservation of our dwindling coal resources—appeal more particularly to those of us responsible for gas supply in great industrial centres, but must necessarily interest every citizen of the Empire. And for this, if for no other reason, everyone administering a gas undertaking with a statutory monopoly of supply should feel he is under an honourable, if not a statutory, obligation to do everything possible to increase the use of gas in his area. He should also not forget that success in such efforts means, through increased turnover, reduced prices to the consumer, and possibly (though not desirably) larger contributions to the rates. But no one can fully develop the sale of anything, however useful and satisfactory, except by making known its merits and advantages; and this can only be done by means of skilful and persistent publicity.

Every successful business spends large sums of money on advertising and other forms of publicity—far larger sums in proportion to turnover than the gas industry has yet dreamt of spending, or at least than the great majority of gas directors and committee men have dreamt of spending. [I should not like to answer for the Executive Chairman's dreams in this direction.] The sum of 2s. 6d. per million represents one penny—not the present price of one postage stamp—per actual known customer per annum! How would this compare with the expenditure of any leading drapery store, or motor-car business, or soap or chocolate manufacturer? The gas industry has in the past thought on very small lines in this vital matter of publicity—mainly, perhaps, because those who have to provide the money are too prone to regard it as an "expense." No business man reckons money paid for publicity as an expense, but rather as an investment—money which, if it is wisely laid out, comes back over and over again in larger turnover and disproportionately increased profits.

Even the Government have found out the enormous value of publicity during the war. Think of the Recruiting Campaign, the Food Economy Campaign, the War Savings Campaign, and then recollect that before the war the Government never advertised on business lines. Well, some of us in the gas industry want to take a lesson here even from the Government, and wake up to the productive character of publicity. Then I am sure that the Association's ambition of 2s. 6d. per million from 100 p.ct. of the industry will before long be more than attained, as we shall have undertakings volunteering a higher rate of subscription in order to get—as they would get—a still higher rate of return. Municipal undertakings ought to subscribe as freely as company undertakings—indeed, all the largest of the municipal undertakings do subscribe more freely than some of the larger company undertakings, I am surprised to find—because it is just as much their duty to expand their business, and cheapen their product, as if they were in business for private profit.

No municipality ought to be satisfied until its publicity methods, its show-rooms, its exhibitions—all its commercial arrangements—are as effective and as efficient as those of any company. And this should include businesslike, informed, courteous service on the part of every one of its employees, from the fitter's boy up to the general manager; for without good service to follow sales the best advertising campaign in the world will not secure permanent profitable results. This is a point which the "B.C.G.A." in its "Bulletin," and by every means in its power, constantly emphasizes, and on which it proposes to do more to develop and render service to the industry when the war is over; and I strongly commend this aspect of its policy, and its propaganda within the industry, to the favourable consideration of all gas administrators.

If we as an industry are to make the progress we could, and should, make in the strenuous times before us, we must modernize our methods throughout, not merely within the works, but on our districts, in our show-rooms, in our offices, and, not least, in our board rooms. We must think commercially, not "officially"—in terms of efficiency, not of complacency. Our staffs must be live representatives of live concerns; not dignified officials of dead departments. It is because I believe the "B.C.G.A." to be capable of assisting the gas industry to attain a far higher level of efficient public service on sound commercial principles, and of carrying on highly profitable publicity work for the industry on very broad far-seeing lines of policy, as well as on those making for immediate results, that I am glad to have been its President, and in laying down the office commend its work to the whole-hearted support of the industry throughout the country.

The PRESIDENT, before resuming his seat, said he was very much indebted to the Chairman of the Executive, Mr. Goodenough, for all the help he had given him during his year of office. Nobody could have had a more loyal supporter than he had. He was glad they were going to have at the head of the Association a gentleman like Lord Moulton, who was not only interested in, but had great knowledge of, all matters appertaining to the gas industry. Possessing this knowledge, he was kind enough to come forward and help them; and his doing so would be of great benefit to the industry. He thanked them all for the support they had given him during his three years of office.

Sir Hallewell Rogers Thanked.

Mr. D. MILNE WATSON (London) said he was sure that all present felt that in Sir Hallewell Rogers they were losing a tower of strength to the Association. He had brought into his work a broadness of vision and a width of experience which were uncommonly great gifts, and which he had been prepared to share with the Association, and with the industry as a whole, in the fullest degree. It had been an enormous asset, not only to the Association, but to the industry to which they were proud to belong, that he had been connected with it so long. He hoped the fact that Sir Hallewell was resigning the chair would not mean that he was resigning his interest. That this was not the case, he felt quite sure, because he was Chairman of the Birmingham Gas Committee; and the traditions of this great Corporation would still inspire him, and be inspired by him. The Birmingham Corporation had always led the way in gas matters. They had been enterprising and go ahead to a degree well known to everyone in the gas industry; and he felt sure that the experience of which their President had given them the benefit had been largely the fruit of years of industrious work in the Corporation. With regard to the Association generally and its future work, Sir Hallewell had pointed out that there was a great deal in front of them, that they were only at the beginning of things; and with unity there would be no length to which the British gas industry could not go. Not only had Sir Hallewell Rogers acted as President of their Association, but he had been a member of the Executive Committee of the National Gas Council; and there, owing to his courtesy and knowledge, he had been of the greatest service in their deliberations on the many questions that had come before the Council. It was to be hoped that these services would always be available. With his help in the Association and in the Council, they might go forward undaunted and undismayed. He moved a very hearty vote of thanks to Sir Hallewell Rogers for his address, and for his services in the position he had occupied so honourably during the past few years, and wished him in his retirement from it health and prosperity.

Unity Essential.

Alderman W. KAY (Manchester) seconded the motion; remarking that he did so with pleasure, while at the same time regretting that they had to part with the President's services. The address they had just listened to was very much to the point—as ought to be the case at a critical time like the present. They were indebted to Sir Hallewell for many hints for the future—the chief of which was that there should be no division in the industry. He and all of them had striven to bring about unity. Without this, they could not hope to succeed; and those of them who earlier in the day had the privilege and pleasure of listening to Lord Moulton must have noticed right through the whole theme the desire and necessity—if at any time, now—for unity of action. He (the speaker) could not conceive anything different. Indeed, he went so far as to say—speaking for Manchester and Birmingham—that any help that they might get from municipalities would go to the wall

completely unless they did present a united front at this critical time. They found themselves faced with the competition of electricity; but by unity of action they could overcome any difficulty arising from this. The whole address was filled, from start to finish, with the desire for unity. And not only of companies and corporations, but the Society of British Gas Industries as well. It was no use manufacturing a product unless one could sell it; and it could not be sold without apparatus. Therefore they must look at the matter in the broadest view. Unity of action was more desirable to-day than ever. They were indebted to the President for having pointed this out in so strong a manner. He regretted they were losing him from the position of President; but he had the greatest pleasure in adding his testimony to the eminent services he had rendered to the gas industry.

The PRESIDENT (when the vote had been carried by acclamation) thanked them for the cordial way in which the proposal had been put and agreed to. Really, he said, he had done very little as President. He had not been able to attend as many executive meetings as he would have liked, but had kept in touch with what had been done, and hoped still to have an opportunity of doing this. His period of office had been a great pleasure to him.

ANNUAL REPORT AND ACCOUNTS.

Mr. F. W. GOODENOUGH (the Chairman of the Executive) then submitted, on behalf of the Committee, the audited accounts and the report for the past year. The report was in the following terms:

THE REPORT.

The General Committee then presented their Seventh Annual Report and Statement of Accounts as follows:

INCOME.

The income for the year is nearly £1000 less than in the previous financial year, partly by reason of a drop of £680 in the contributions by the Society of British Gas Industries, and partly through a slight reduction in the amount received from the Special Purposes Fund of the Institution of Gas Engineers, to which, in the first instance, the subscriptions of gas undertakings are paid. This reduction is due, not to a fall in receipts, but to the fact that the important research work at present in hand by the Institution necessitated the retention by the Institution of a larger sum than in the previous year (£1157 as compared with £883) to meet the cost of that research and of other special work carried out by the Institution for the benefit of the industry as a whole. The rules of the Association provide that not more than 10 p.ct. of its income may be devoted by the Institution to such special purposes; and the amount retained has been well below that limit.

It is very satisfactory to be able to report that there is no falling off in the support received from gas undertakings. On the contrary, the number of new subscribers added to the list during the past year is the largest for any year since the outbreak of war.

The new subscribers number 45, making a total of 547, as compared with the 253 with which the Association started. A large proportion of this satisfactory increment in membership took place in the latter part of the financial year, mainly as the outcome of the work done by the Association in the Provinces in connection with the Food Preservation (Canning and Bottling) Campaign and the Household Fuel and Lighting Order.

EXPENDITURE.

Administration expenses show an increase of £223, which has been occasioned entirely by war conditions; but the total still does not represent more than 7 p.ct. of the total income. The item of £1000 contributed to the expenses of the National Gas Council will undoubtedly be regarded by members as money well spent during a year which has been very critical in the history of the industry, and during which the activities of the National Gas Council have been continuous. It is hoped that before long the financing of the work of other organizations in the industry will not have to be met out of the income of the Association, which in normal times is altogether insufficient for the effective carrying out of all the work which could with much profit be undertaken by it on behalf of the industry.

The expenditure on publicity shows a decrease of £540 in the year. The reduction would have been much greater but for the spending of about £3000 in the month of August on the campaign for educating the public as to the meaning of the Household Fuel and Lighting Order and the national importance of economizing in coal rather than in gas. There is ample evidence that the campaign was both timely and fruitful.

It should be borne in mind, in considering the expenditure on publicity, that, owing to the substantial rise in the cost of advertising space, the amount of publicity secured per £1000 expended is now substantially less than in pre-war days. If this should continue to be the case after the war, the question will have seriously to be considered of obtaining a corresponding increase in the income of the Association, the subscriptions to which remain on the pre-war basis.

The balance at the credit of the After-War Campaign Fund has been increased by £1000.

PUBLICITY WORK.

The publicity work done during the year—apart from that connected with the Food Preservation Campaign, National Kitchens, and the Household Fuel and Lighting Order—has been confined to continuing and extending general and unobtrusive educational work calculated to increase the demand for gas and gas appliances in coming years. This includes the steady development of the work directed to interesting teachers and their pupils in the manufacture, distribution, and applications of gas by the publication of notes for lessons on these subjects. They have been much appreciated by teachers and education authorities in many districts; and the work might be considerably extended by local effort.

In connection with the publicity campaign, a great deal has been done by way of distribution of literature, particularly copies of the special issues of "A Thousand and One Uses for Gas" (dealing, among other subjects, with "Women in the Gas Industry in War Time," "Food Preservation and Conservation," "Coke," "National Kitchens," and "Industrial Efficiency") and the reprint from the "Bulletin" of articles dealing with Gas *v.* Electricity for Cooking.

THE FOOD PRESERVATION (CANNING, BOTTLING, AND DRYING) CAMPAIGN.

Assistance to the Government in this branch of National Service was undertaken by the Association in November last. In response to the appeal issued, some 200 gas undertakings came forward to assist the Government, and much good work resulted. A poster was designed and 7500 issued; three special issues of "A Thousand and One Uses for Gas" were devoted to the campaign; and over half-a-million leaflets and booklets were distributed.

It is unfortunate that the fruit crop generally throughout the country has been the worst experienced for the last fifty years. Had this not been the case, the campaign would have been a great success. Even as things were, the results achieved, in proportion to the possibilities, were excellent, and fully warranted the Association's effort, which has been admitted by the Food Production Department to have been largely responsible for such measure of success as was obtained. The work has brought the industry into close touch with the local authorities throughout the country, and much interesting correspondence has been received, especially from those responsible for education and agriculture. The campaign will be resumed early next year.

GAS FOR TRACTION PURPOSES.

The Association has been represented upon, and has given evidence before, the Committee on Gas Traction, which has issued a valuable interim report during the year, and is continuing its investigations.

ASSISTANCE RENDERED TO MEMBERS AND OTHERS.

This branch of the Association's work has been active during the year, and many varied and important subjects have been dealt with for a considerable number of undertakings with satisfactory results.

HOUSEHOLD FUEL AND LIGHTING ORDER.

The Association has issued as a supplement to the "Bulletin" a digest of the Order so far as it affects the sale of gas; and, in addition to the publicity campaign referred to above and the furnishing of correct information to the Press at a time when much misunderstanding of the elementary basis of the Order was rife, it has given assistance to the industry in dealing with the difficult problem presented by the Order by the publication of "Hints on Fuel Economy" and tables showing how the ration for each size of house can be divided as between coal and gas. Large numbers of these publications have been sold.

VICE-PRESIDENTS.

The following have been added to the list of Vice-Presidents during the year:

Mr. John Edward Cowen, J.P. (Newcastle-on-Tyne).
Mr. J. H. Ellis (Plymouth).
Sir Robert Hadfield, Bart., F.R.S., D.Sc.
Col. Henry Stephenson, D.S.O. (Sheffield).
Mr. Thos. Waddom (Newcastle-on-Tyne).

OBITUARY.

The Committee have to record with deep regret the death of three Vice-Presidents—Sir Joseph Bellamy, of Plymouth, Sir William H. Stephenson, of Newcastle-on-Tyne, and Mr. Thomas Berridge, of Leamington, who was from its formation a valued member of the Executive Committee—and of another of their active members and supporters, Mr. Fletcher W. Stevenson, of Coventry.

PROPOSED ADDITION TO THE GENERAL COMMITTEE.

In view of the increasing number of subscribers, and for the purpose of ensuring adequate representation of the various districts on the General Committee, the Committee recommend to the members as follows:

That Rule 7 be so altered as to read:

The General Committee shall consist of:

(E) Ordinary Members representing:

(1) The several subscribing gas undertakings in various specified areas mentioned below, and

(2) The Society of British Gas Industries, or any similar Society.

Such respective representations shall be on the following basis:

The subscribing gas undertakings shall be grouped into the under-mentioned areas, each of which areas shall be represented by at least one member, with an additional member for every £250 per annum subscribed by the whole of the undertakings situated within the specified area: Eastern District, Ireland, Manchester District, Midland District, Northern District, Scotland, Southern District, South-Western District, Wales.

(3) The Society of British Gas Industries, or any similar society, shall be represented by at least one member, with an additional member for every £250 per annum subscribed by such Society.

HALLEWELL ROGERS, *President.*
F. W. GOODENOUGH, *Chairman of Executive.*

Mr. GOODENOUGH said that, considering that this constituted the fourth complete year of working under war conditions, the financial account and the statement of work done might be regarded as not unsatisfactory in most particulars. With one noticeable exception (which spoke for itself), the items on the income side were satisfactory. The increased sum devoted to research work by the Institution of Gas Engineers more than accounted for the small reduction of £230 in the net amount transferred to the Association. The gross

receipts from the gas undertakings throughout the kingdom had amounted to £17,121, as against £17,077 in the previous twelve months. This brought up to £150,000 the total amount subscribed by some gas undertakings in the country, and some of the manufacturers, for the benefit of the industry as a whole, during the seven years of the Association's existence, including the expenditure on the National Gas Exhibition.

This was a fact to be commended—together with the President's exhortation—to the consideration of those gas undertakings which had not so far contributed their share to the common fund. If they would all pay up the seven years' arrears, the Association would have a nice sum to add to their "After-War Campaign Fund"—which they were now looking forward to spending at no very distant date. And they would want every penny they could get, if they were to put up an adequate fight for their industry in the days that were before them. From information that reached him, he could tell members that the competition they had to meet before the war was but a trifle compared with what they would have to face presently. Therefore, while full of faith in the future of the industry (he believed it never was more asured of progressive prosperity if its opportunities were seized and developed), he wanted, in all earnestness, to beg of the members to remember that—as Father Healy remarked to the Cardinal, who had missed his train through faith in his watch, which had failed him—faith was of no avail without good works, and to do everything in their power to increase the income of the Association and to co-operate with its work in the current year.

Expenses, as they would see, and would have expected, were on the increase. Administration expenses were up by £223; while the value they obtained per £1000 spent on publicity had fallen, and was falling, as the cost of paper and printing compelled the papers to raise the price of space. They had got £3000 at the credit of their after-war account; and some of the publicity expenditure during the past two years had been upon preparations for future campaigns. Say they had £5000 in their reserve, this was but a trifle compared with what an effective publicity campaign throughout twelve months would cost. Some estimate of what could be advantageously spent upon a full year's publicity might be formed from the one fact that the recent comparative small splash made in connection with the Fuel Order had cost them close upon £3000. The industry could spend with much profit £50,000 a year on its national propaganda through the Association, and at least another £50,000 on strictly local publicity.

As the President had well said in his address, they had not begun to think big enough yet in their business development work. They were still inclined to be shy over it, and think it almost undignified to advertise; or if they did embark upon an advertising campaign in the local papers occasionally, they made it possible to plead the servant girl's excuse that it was only such a little one. Well, that was the way to get the least return for the money spent. Advertise half-heartedly, and they would certainly lose their money; advertise effectively and persistently, and they would profit handsomely. And if they were going to keep their end up in the near future, unless he was seriously misinformed, they must be prepared to put up no half-hearted effort.

Fortunately, the work of the past seven years, and not least the work done in the later years of the war—little of it as might at times have been apparent on the surface—had laid foundations for the future that would serve the industry well in the difficult days to come. He gave a pretty full account of this work a year ago, and need not enlarge upon it again, as the report brought the record fairly up to date on broad lines. This work—both the obvious and the hidden—had been rendered possible by the steady, unwavering support of three-fourths of the industry, measured by output; and he was glad to say that the signs for the current year were excellent for the maintenance and increase of their income. Since the end of the financial year several new subscribers had been enrolled, representing an output of nearly 1000 millions; and the stream of cheques from those previously on the list had already begun to flow rapidly. Tottenham, the first subscriber to enrol at the foundation of the Association, were always among the first to renew their subscription; Manchester and Salford, as usual, were early to the fore with close on £1000 between them; and half the year's income was assured before six weeks of it had passed. Melbourne (Australia) had demonstrated her faith in the value of the work done, even on the other side of the globe, by sending a cheque for £100 in respect of the past and current years; and from not a single undertaking to which application for the renewal of subscription had been made had there come a refusal.

Such tangible confidence in their work had encouraged the Committee to present the account of their stewardship for the past year with the hope that it would be adopted as not unsatisfactory under all the circumstances of the times, and to go forward to the work of the future heartened to attempt to do much more for the industry they had the honour to serve. On their behalf, he submitted the accounts and report.

He expressed his personal thanks to the President for the kind things he had said about him in connection with the work during his years of office. He could only hope to always have as encouraging and helpful a President to work under.

More Work Ahead.

Alderman F. S. PHILLIPS (Salford) moved: "That the report of the General Committee and the audited statement of accounts for the year ended Aug. 31, and the recommendations for the alteration of the rules as set out in the report, be approved and adopted." This child of theirs, he remarked, the "B.C.G.A.," was celebrating its seventh birthday; and a wonderfully healthy and active child it was. As the years were added to it, its activities were increasing; and so it was with the Chairman of the Executive. He wished to pay his tribute to Mr. Goodenough. Indeed, he could not conceive what the Association would have been or could have been without the foresight, the knowledge, the interest, and the ability that Mr. Goodenough had consistently, throughout its life, displayed on its behalf. Even during the long period of war, the Association had not failed in any way. But they hoped that brighter days were dawning, and that better things might be achieved, to the improvement of the world, and not the destruction of all that had been built up by many years of effort in the past. And in this work the Association would have to take its share. Whatever it had done in the past, on the declaration of peace it would be called upon for a good deal more. It would have to plan for them, think for them, and indicate to them how they should proceed in the extension of the gas industry. It was true, no doubt, that they had fulfilled a very important function in the war by producing explosives; but afterwards they would produce something which would do humanity much more service by contributing to its happiness, its comfort, and its prosperity. With regard to the report itself, this revealed a satisfactory condition of affairs, which showed that there had been an impression produced on the gas industry that the Association was needful to them, was needful to the consumers, and was needful to the country. While seven years ago they began with 255 subscribers, this number had been more than doubled, until there were now, he thought, 547 subscribers. The report said that this growing infant had found his clothes a little too small; and they were asked now to let out the coat a bit. They were having some further Vice-Presidents and members of Committee, and in mentioning this, he would like to pay a tribute to those who had been Vice-Presidents, but who were no longer with them. They revered their memory. He hoped the thoughtful address they had had earlier in the day from Lord Moulton would appear in the report. It was absolutely essential that everyone concerned with the gas industry should be able to read the address and digest its contents. They were approaching middle age. He was doing so himself; but he had a little remedy for this. When he was young, he used to anticipate a year; but now he had changed this—he took one off each year instead. [Laughter.] This was what they required to do. They should conceive themselves as being consistently and continually young. He thought the Association would not do badly if it planned for the gas undertakings throughout the country an extended and a more active scheme of operations, which could be taken in hand on the conclusion of the war. They wanted it so as to think it over and get all ready for a start when the time came.

The Strength of the Industry.

Mr. SAMUEL GLOVER (St. Helens) said he did not know whether he had been asked to second the vote in his official capacity as President of the Institution of Gas Engineers, or because he was the representative of one of the municipalities who had newly become subscribers. He was not, however, a new convert, because he had admired and esteemed very highly from the foundation of the Association the work that it was formed to do, and had consistently and persistently done. Notwithstanding all they had heard, he did not admit that the gas industry suffered from old age; how could it? He, for instance, had been associated with the latter and more intelligent half of its existence. [Laughter.] It had been under some such misconception of its forcefulness and ability as the British nation was when it was considered by its enemies to be a defunct nation. The force and power shown by the Association and by all those who were working for the good of the industry were inherent in the industry; and the new usefulness, the new purposes, the new attainments that had been so beautifully pictured and praised to them that day, were inherent in the industry. The newer industry, electricity, which had seemed to be the pet child of the family, had usurped the place of other people, by putting its goods in the shop-window in a better manner than the gas industry had done before the "B.C.G.A." was formed. Now the Association showed them how to sell their goods and display them to the best advantage.

The PRESIDENT remarked that they were pleased to have their Scotch friends with them, and would like to hear a few words from Judge Elliot.

Views from Scotland.

Judge STUART DOUGLAS ELLIOT (Edinburgh and Leith) said he had read the report with the greatest possible interest. It was a record of which any Association might well be proud. Whether they had regard to the work of its publicity department, to its action in promoting the use of gas, or to its educational efforts in the matter of the fuel and light regulations,

everything that was done had been well done, and had been for the advantage not only of gas undertakings but of the whole community. It had been really useful work. As to the accounts, in the abnormal circumstances of the present time, it was only to be expected that the expenditure would rise in greater proportion than the income; but, after all was said and done, the deficiency of this year was more than equalled by the surplus of last year. During the past year, not a single penny out of £18,000 had been spent in law charges. He had been struck by this fact. [Laughter.] But this seemed to be a habit of the Association, because in the previous year legal expenses only amounted to £6. He hoped that in another year they would have very much reduced the number of concerns still outside the Association, and that in time they would get the unanimous adhesion of the gas undertakings of the country.

The West of England Proud.

Mr. J. H. Ellis (Plymouth) agreed that the works of the Association spoke for themselves, and carried their own commendation. They had good reason indeed to feel satisfied with the labours of the Association in times of altogether exceptional stress and difficulty. The North of England and Scotland had spoken; and might the extreme West of England say how satisfied it was with the work that the Association had done for them—an agricultural district—in the matter of food preservation, in relation to canning, &c., and in showing the real advantages of the fertilizer which the gas industry produced? They were not only satisfied with the benefits they had received, but they in the West of England were extremely proud that one of those who had done such great national service in these terrible times was a worthy Son of Devon, whose wisdom, whose industry, and whose geniality had done so much good for them. He need hardly say he alluded to the Chairman of the Executive, their friend Mr. Goodenough.

The resolution was then unanimously agreed to.

Committee Members and the War.

Mr. J. Ferguson Bell (Derby) proposed: "That, in view of the continuance of the war, the retirement from office of those members of the Executive and General Committees who would otherwise have retired at this meeting be postponed until the annual general meeting in 1919." He said that, after the way in which the report had been received, and the high commendation of the various speakers, the meeting would see that this was not a prudent time to change officers. There were great problems in view. They heard of reconstruction questions on all hands; and the gas industry would have to take its place with others. The Association during the seven years of its existence had done admirable work. Much credit was due to the Chairman of the Executive; and they had been extremely fortunate in their Presidents. Of Sir Hallewell Rogers, as he came from the Midlands, he could perhaps speak, because they knew him to be a leader of men, and an honourable citizen of the great Metropolis of Birmingham; and they would have a worthy successor in Lord Moulton. He was not one who believed that those elected to office should always retain that position; but at the present time it would be unwise to make changes.

Mr. H. C. Head (Winchester) seconded; remarking that, though in normal times the infusion of new blood was desirable, he was opposed to "swapping horses while crossing the stream."

The proposition was agreed to.

Votes of Thanks.

Bailie J. C. Drummond (Glasgow) proposed a vote of thanks to the Executive Committee and officers for their services in the past year, with an expression of sympathy with the Secretary in his illness and of hope that he may soon be restored to good health. He said he was sure the Chairman of the Executive had energy sufficient to cope with any electricity that might come along. They would all agree that both he and the Executive Committee particularly had done just about as well as it was possible for them to do. As to Mr. Mason, he had been very ill, but fortunately now was much better, though still not quite up to his usual mark. They hoped he would very soon be back at his work. It must have worried him that he had not been able to get back long before this; but the Chairman and the Executive pressed upon him not to return until he was absolutely better.

Mr. H. E. Bloor (York), in seconding, said every single member of the Association regarded Mr. Goodenough as the "B.C.G.A." He stood for it. It was his child. He created it; and a very lusty child it was. But every general must have a chief of staff whose services were really indispensable to him; and the chief of staff behind Mr. Goodenough was Mr. Mason. No man who had ever been fortunate enough to have an absolutely loyal personal assistant could ever belittle the importance of him. Mr. Mason had been seriously ill; but he hoped greatly that the day might come when he would be back fully restored in health and strength. The resolution covered the Committee and officers, so that he ought to mention their Editor, Mrs. Cloudesley Brereton. If it was difficult to conceive a "B.C.G.A." without Mr. Goodenough, it would also at this time of day be rather difficult to picture it without Mrs. Brereton. Her vitalizing influence, the atmosphere that surrounded her, buoyed them up and stimulated them to an extraordinary degree. He thought he was right in saying that Mrs. Brereton came to them largely in recognition of the value of the industry to the community, of which value she had become convinced through her other activities; and the fact of her coming to them at all was in itself a very encouraging sign. They all appreciated her, and hoped she would continue for many years to come to help them in their work. As to the Committee, they had done good work.

Mr. Thomas Glover (Norwich) supported the resolution because he had come into intimate contact during the past year with the Secretary, who was unfortunately absent through illness, and whose merits they recognized. He (Mr. Glover) might be partly responsible for this illness; or it might be that the special work he (the speaker) undertook at the request of the Chairman of the National Gas Council, to help the Coal Controller, partly accounted for Mr. Mason's breakdown. When he was dumped-down in the department which faced the enormous task of trying to make the short supply of coal fit the essential needs of the industries of the country, and at the same time to reorganize the transport to enable the supply of coal to be delivered to these industries, he found himself face to face with a very big work, and for some while was alone doing the best he could. Then he approached Mr. Goodenough, and asked him if it would be possible for Mr. Mason to come and render some help, as it was essential they should have someone who knew something of the industry and of the men who were connected with it. This was soon arranged; and Mr. Mason worked very well as long as his strength allowed it, and until he was obliged by his doctor's orders to take a holiday. It had subsequently been seen how ill he really was, and how necessary it was for him to relinquish his work. They had missed him very much; and the work had no doubt suffered for a time by his loss; and they all very anxiously looked forward to the time when he would be able to resume his important duties in connection with the Association.

The Coal Position.

With regard to the coal position, it might be possible for the Coal Controller, who was unable to be present that day, to attend one of the meetings of the Institution of Gas Engineers, to say something to those who had done their best to save coal, and explain the position. He hoped it would be possible; but, at all events, there would be a message from him, if he was unable to attend. He was just now confined to his house. Perhaps later on in the week, he (Mr. Glover) would take an opportunity of saying something more.

The resolution was unanimously carried.

Mr. H. James Yates (Birmingham) said he knew Mr. Walker had been doing good work in the absence of Mr. Mason; and he thought their thanks should be given to him.

Mr. Goodenough, in returning thanks on behalf of the Committee and officers, said it was feared at one time they would lose Mr. Mason; but he hoped in a few weeks he would be back again at work. He was obliged to Mr. Yates for what he had said. Without Mr. Walker it would have been very difficult to carry on at all. As to himself, his work had always been a labour of love, and had been rendered easy and pleasurable by the cordial co-operation of the Executive Committee and the General Committee.

The New President.

Mr. Goodenough announced that the Scrutineers had found, by examination of the balloting-papers, that Lord Moulton had been unanimously elected President for the forthcoming year. Messrs. Cash, Stone, & Co. had been re-elected Auditors.

The President said he had very much pleasure in asking Lord Moulton to take the chair. He himself had for three years been President of an Association which was really formed to sell gas; and during the greater part of this period the Government said they must not sell it. [Laughter.] He hoped Lord Moulton would be more fortunate. He need hardly say how cordially they all welcomed him to the chair.

Lord Moulton (who was received with loud applause) thanked them for the great honour they had done him in choosing him to occupy the chair. He felt, however, his predecessor had done everything he could to make his occupation of it a failure. He had left a splendid record behind him; then the first thing he called upon him (Lord Moulton) to do was to turn him out of the chair and the next was to refer to the conduct of the Government with which he (the speaker) was closely connected. He would have a difficult task in struggling against these early prejudices, but he hoped a successful one.

The proceedings closed with a vote of thanks to the Council of the Royal Society of Arts for granting them the use of their hall for the meeting—moved by Mr. W. E. Price (Hampton Wick), and seconded by Mr. J. W. Auchterlonie (Cambridge).

LORD MOULTON ON ORGANIZATION IN THE GAS INDUSTRY.

Before the business occupied attention at the annual meeting of the British Commercial Gas Association on Wednesday last, Sir Hallewell Rogers, the outgoing President, entertained at luncheon at the Savoy Hotel a number of gentlemen to meet the President-Elect, the Rt. Hon. Lord Moulton, K.C.B., F.R.S., the Vice-Presidents, and the General Committee. Sir Albert Stanley, the President of the Board of Trade, was expected to be present; but other duties caused disappointment in connection with this function.

Among the guests were Sir Arthur Duckham, Sir Boverton Redwood, Sir Arthur Churchman, Bart., Sir Dugald Clerk, K.B.E., Sir Evan D. Jones, Bart., Mr. Joynson Hicks, M.P., Mr. E. Manville (the Chairman of the Associated Chambers of Commerce), Dr. F. S. Keeble, Mr. H. E. Blain, Mr. E. S. Shrapnell-Smith, C.B.E., Mr. W. Doig Gibb, O.B.E., Mr. Frank Pick, Mr. A. Bazire, Mr. S. Glover, President of the Institution of Gas Engineers, Mr. T. Glover, and and Mr. T. Goulden. Among the Past-Presidents and Vice-

Presidents were noticed the Rt. Hon. Sir Daniel Ford Goddard, M.P., Mr. H. E. Jones, Mr. John Miles, Governor of the Gas Light and Coke Company, Mr. Charles Hunt, Mr. D. Milne Watson, Alderman William Kay, Alderman F. S. Phillips, Bailie Thomas Paxton, Bailie J. C. Drummond, Councillor T. Young, Alderman C. W. Pinkney, Alderman J. M'Gaul, Mr. Councillor H. E. Caldicott, Judge Douglas Elliot, Mr. F. W. Goodenough (Chairman of the Executive Committee of the Association), Mr. J. H. Ellis, Mr. A. P. Main, and Mr. Percy F. Holmes.

After lunch, and the loyal toast had been honoured,

Sir DUGALD CLERK said he rose with much pleasure to propose the toast of the "Gas Industries of the United Kingdom," coupling with it the name of Lord Moulton. Speaking for himself, he felt it a great honour to have been connected with the gas industry for more than thirty years on the side of it associated with the development of the gas-engine. Lord Moulton had had perhaps a greater connection with the industry in his later than in his earlier years; but in the early years he did a great amount of work. It was his (Sir Dugald's) fate to have to coach him up in a gas-engine patent case that came before the Courts; and well he remembered it. Lord Moulton's association had been continued with the industry to the present day in connection with the war. Upon him fell the onerous duty of providing the high explosives for its conduct. Everybody now knew, and Lord Moulton knew then, the position of this country in respect of high explosives. But he gathered the gas industry round him; and he obtained all the materials he required from it. What the country would have done during the past four years without the assistance of the gas industry, he could not say. Apart from the war, the gas industry had a history of which it might be proud. It now required in its operations some 20 million tons of coal per annum, and was utilizing it in a most efficient manner. Some people did not appreciate how high was the efficiency of the gas industry.

Lord MOULTON (who was heartily received on rising to respond to the toast) said he could not say how surprised he was at being asked to respond for the gas industry. He was very much astonished when he was asked to become the President of the Institution of Gas Engineers, because he wondered why it was supposed that he was the proper head for the representative body of the industry. But a solution occurred to him. It was that the gas industry, being such a close corporation, had done its business so quietly and with so little advertisement, that it was quite a treat for it to get someone outside who could appreciate its methods. However that might be, he felt that he was to-day addressing men with bright hopes. He warranted there was not a heart in the room that was not very heavy when the first great shock of the war came—much as they all believed in their country, they felt they were going to be tried to the utmost. They then felt they were thrown entirely upon their own resources; that no wealth, no friendly relations with foreign nations could really help this country if it could not help itself. It was just at that moment that he commenced to make his intimate acquaintance with the gas industry. He had known it before. He had been taken by the hand, and led gently through all the experiences of the internal combustion engine; and he knew exactly how it felt. [Laughter.] He found it extremely interesting; but it never then occurred to him that one day he would be the head of a big industry on which the fate of the war depended. He was not exaggerating at the time the value of the industry when he said that it was then he had begun to realize what service, without any *éclat*, the gas industry had been rendering to the country, and had received so little thanks for it. He remembered the time—the end of the year 1914—when he thought, if the Germans had simply gone on, they would have found this country absolutely destitute of the necessities for war. There was no (he could not even use the word "adequate") supply of high explosives with which they could have resisted their enemies. Fortunately, the Germans gave the Allies breathing space; and then the service of the gas industry commenced. He had spoken often of the loyal help that was given to him by the industry; and he would now only say that it was its power to assist that impressed him, as well as the extent to which not only this country, but France, was dependent upon the British gas industry. The two Allies had very little of what was required to enable them to put up an effective defence against their enemies. Now the impression which was gradually made on his mind by all this experience was (should he say?) not so much of special efficiency, not so much of special technical victories, but of the enormous value of the domain over which the gas industry ruled. He began to see how not only in the gas which ordinary members of the community considered was the most important thing the industry produced, but that in the by-products—in the benzol, in the toluol, and in everything of that kind—the industry were making wealth, industrial wealth, for the people to whom their value was but little known. When the war came, they found this priceless; and they ought to have found it priceless in the days of peace. And the great lesson for the industry was that they should make this known, and should make its value tenfold greater than it was. It was within the power of the industry. Looking back, he thought the gas industry was the least fully exploited domain of production. It had only begun to scratch the surface of possibilities lying within its grasp. They had learned that nothing made amends to a nation for neglecting home production which might be essential to its success in war. They had learned that a nation might in time of war be absolutely isolated; and it was only on its own production that it would have to rely at such moments. That which the gas industry could produce was found to be, in ways utterly unsuspected before, becoming essential to national defence. It was found also that those branches of industry which would have been most profitable, but were most neglected, rested on products of the gas industry. Therefore he felt that, in answering for the gas industry, he could say that it had quite an undeveloped mine of industrial wealth. At the same time, he might remind the industry that it was up to it to exploit the mine. Why was it the gas industry had been in existence for a hundred years and more, and that the true potential value of their branch of industry had not been shown? He thought it was because of this: Its undertakings were essentially local; they were isolated one from another, because they could only perform their function of gas supply in the districts allotted to them. Therefore there had been no true competition between them. Their incentive had been efficiency and serviceability to the public. He granted that this had shown a very great development in the line of an adequate and satisfactory production of gas. During the whole first eighty years of existence, there was practically no competition. Each gas-works did the best it could. But it was not "Woe be to it if it did not do so." It was really saved from the stimulus which was accorded to other industries. To-day that condition was very much changed, unfortunate as it might be to some. They had a fierce and efficient competition with electricity. Electricity had itself competition from the first; and so from its initial stage electricity had gone on the line of research, which had gained it broad lines of expansion. It had taken up ambitious schemes, because it had had the great gas industry established before it for eighty years, with upwards of 100 millions of capital invested in it. Electricity had had from the first the gas industry as a rival. The gas industry had got middle-aged before the electricity industry came on the scene. And although a man might be healthy when middle-aged, he was not quite what he was when he was young. There was no doubt whatever that, although many faculties were better developed with the growth of years, there were things in youth which were lost with years never to be regained. And he could not help thinking that the gas industry was middle-aged when this competition came upon it. He did not say the gas industry was not doing its work well. In the direct competition for lighting, for heating, and for motive power, the industry claimed—and he thought with very great truth, and on very sound grounds—to be undefeated. But the industry did not appear to have felt the necessity to show its reserve of power in its struggle to maintain itself against its rival. They saw electricity was putting forward splendid and wide-reaching schemes. It got both the admiration and the support of the Government of the nation, because it held out such splendid prospect of increasing the national power. The gas industry had resources undeveloped which could show an equally valuable reserve of undeveloped power. But the gas industry was not accustomed to look to people who were doing research; it had always pinned its hope upon the steady body of men who had tried all these years to carry on, and had well and satisfactorily carried on, gas production. It seemed to him that gas men wanted to fix their eyes on the changes they could bring into the industry rather than only maintain the excellent standard they had shown in the past. To accomplish this, they would have to do what certainly the electrical world had done; they would have to have union, so that there might be united energies. He was touching a subject which would be a dangerous one if it were not that he was absolutely conscious of his own profound ignorance of it. [Laughter.] The difficulties might be numerous of merging into one effort the many diverse efforts in many directions which had been set on foot, and wisely set on foot, for the development of several different aspects of the industry. But they must have union; they must have research; and they must be willing to take the results of any knowledge and experiments, and to carry them out. They had one thing which was at once a great hindrance, and yet a great help. The plant the industry used was big; the amount of capital involved was large. There was, if he might use the simile, necessarily great inertia in capital when employed in industry. But the inertia of a body was not only an objection to be moved if it could help it, but an equally stubborn objection to be stopped. If they could only get this vast body of capital moving, backing-up the best of the knowledge of to-day, and embodying it in the industry's practice, then, when once the industry began to do this, it would be as difficult to stop it making progress as it had been to start it off. This therefore was his advice. They should realize that the tasks before them, the possibilities which they might obtain, were rich beyond any of their ideas. He saw in papers that were written by various people in all parts of the globe that there was a growing knowledge which would make the industry master of all the powers which lurked in the substances with which it dealt. If the industry would only actively realize in respect of this great undeveloped field the teachings of research, it would enable it to open up this mine of wealth. Then he felt sure the prosperity of the gas industry would not need any toast; it would come of itself. [Cheers.]

Mr. H. E. JONES proposed the toast of "The Health of Sir Hallewell Rogers." He mentioned that Sir Hallewell had filled the chief office in the Association for three years; and Lord Moulton had done the industry the honour of accepting the presidency. He also spoke of the great work Sir Hallewell had done for the gas industry in Birmingham, the Gas Department of which commanded respect in several ways, not the least being for its scientific research. The members of the British Commercial Gas Association were thankful to him for his services during the past three years, and those present also thanked him for his graceful hospitality that day.

Sir HALLEWELL ROGERS, in reply, expressed the pleasure it gave him to welcome that day so many representatives of the gas industry, as well as members of Government Departments. He could assure them that his association with the gas industry in Birmingham for some fourteen or fifteen years had been such that it had afforded the greatest amount of pleasure. Lord Moulton had given them a splendid speech. If he (Sir Hallewell) had done nothing else for the industry than to ask his Lordship to be kind enough to succeed him as President of the Association, he had done something of use. Lord Moulton had accused the industry of being middle-aged. His Lordship was himself middle-aged when he took up the great work of the Explosives Supplies Department for the country. [Laughter.] This fact should be a great help to the gas industry; and it should be a valuable lesson to them all. If Lord Moulton could work for so much success then, could the gas industry not do it now? There was one note he should like to strike, which their President-elect had also struck. They of the industry would not do any good unless they had union among themselves—engineers, chemists, managers, manufacturers, and everybody connected with the industry. They must all be in one common union. If they could only effect this, they would prosper in the future. In resigning the presidency of the Association, he should like to say his heart would always be with them, and his services also.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Gas Investigation Report.

SIR,—As I was unable to be present during the discussion on the report of the Research Sub-Committee, at the meeting of the Institution last week, may I be allowed, through the medium of your columns, to express my appreciation of the practical character of the report. This may not appear unfitting on my part, since I feel myself to be, in a measure, responsible for the labours which it represents.

Prof. Cobb is reported to have stated that the original proposal for this inquiry was made at the end of 1916. But no decision on the subject had been arrived at when, early in 1917, I asked him, in entire ignorance of the action or inaction of the Institution with regard to it, to undertake exactly such an investigation on behalf of the South Suburban Gas Company, who were prepared to bear the whole expense of it, on the Professor's own terms.

It is, however, all to the good that this important investigation was eventually undertaken by the Institution; and further instalments of results will be awaited with great interest.

CHAS. HUNT.

17, *Victoria Street, S.W., Oct.* 19, 1918.

Treasures of Coal Tar.

SIR,—Referring to your editorial note in the "JOURNAL" of this week, I would suggest that you have quite overlooked my real point, which is that for ten years at least it will be quite uneconomical from a national standpoint for one section of the community to be putting up works in competition with established plants that already exist and are capable of dealing with the situation. It is also vitally necessary that no one in the country should be using material and labour for work other than that required for reconstruction consequent upon the war.

H. C. HEAD.

Winchester, Oct. 18, 1918.

[We are extremely sorry that the "real point" of Mr. Head's letter is not the one which, on reading his previous communication, we regarded as the superior. The order in which he made his points was: (1) "While plants remained in existence capable of distilling the whole of the tar produced, and (2) while all available material and labour were required for carrying out work of vital importance." We do not know what information Mr. Head has in his possession which entitles him to fix ten years as the period within which the industry should remain quiescent in regard to any new tar policy. It is not, however, forgotten by us that this is a period of reconstruction, and one in which (with the assistance of the present Government) old methods are being scrapped and new ones adopted. The period of special facility may have entirely disappeared in ten years' time. Certain it is the distillers will in ten years' time still have "plants in existence capable of distilling the whole of the tar produced." The fight with the chemical manufacturers is not a remote page of history; and the one-third restriction is here. Now gas undertakings are asked to bind themselves in regard to the sale of their tar for ten years, during which they will not be able to move in any other direction, whatever may happen or offer. Mr. Head mentions "national standpoint." Has not the industry its own interests to consider? And are not these interests of national importance?—ED. G.J.]

Incandescent Lighting with Gases of Low Calorific Value.

SIR,—The discussion on the Gas Investigation Committee's report at the meeting of the Institution of Gas Engineers last Thursday, has given prominence to the importance of the above topic. It may be of interest to your readers and the profession generally to recall the fact that the first incandescent burner successfully using gas of as low a calorific value as 198 B.Th.U. gross was invented by me in 1903. An ordinary Welsbach upright "C" mantle was used giving 150 candles. These figures were certified by the late Prof. Lewes, in a report in which he stated the results "are novel, and were considered impossible." In view of Mr. Tookey's statement that he had seen at Nuneaton an incandescent burner using gas of a less calorific value than 350 B.Th.U., and other assertions that producer gases, owing to their low calorific value, could not be used for incandescent lighting, the above results may possibly be remembered as a contribution to the development of the uses of low-grade gases.

J. CHAMBERLAIN, M.Inst.Mech.E.

133, *Embleton Road, Lewisham, S.E., Oct.* 19, 1918.

Mr. Orme Bastian's Recent Declarations.

SIR,—I notice in your issue for Oct. 1 that you wish me to make certain tests, most of which I have already made, and some of which could lead to no conclusive results. I have discussed the subject of such tests as you suggest, in the course of correspondence with Mr. Goodenough, conducted during the end of 1913 and early 1914; and I have neither the leisure nor the inclination at the present time to retraverse the arguments and views expressed in that correspondence. I have gas-fires installed for experimental purposes in my own house; but from motives of economy during the war, they have been very little used, as my gas bills will show.

I enclose two samples of brass picture wire. One sample is very corroded, and was taken from a room in which two gas-fires are installed. The other sample is not corroded, and was taken from a room which is electrically heated. Both rooms are in the same house, and therefore the atmospheric conditions were the same to which both samples were exposed over the same period of time. My gas-fires having been installed with exceptional care, and under the best expert supervision, I am quite prepared for you to come and examine them any evening by appointment.

I do not suppose that you will deduce anything to the detriment of gas-fires from these samples of wire; and I am, therefore, curious to know how you will explain the difference that certainly exists between them.

C. ORME BASTIAN.

185, *Wardour Street, W., Oct.* 15, 1918.

[We regret that Mr. Bastian is not prepared to conduct the chemical and physical tests which we proposed to him, in the presence of a qualified gas representative, and with modern gas-fires and electric-heaters. Regarding the brass wires, Mr. Bastian might find out something very interesting if he tested London air taken from any place; and, if he will alter his present decision, every convenience shall be given him to take samples of the air in the rooms in which modern gas-fires are used, from the outer air, and from a room in which gas-fires are not employed. The taking of these samples and the chemical testing of them by Mr. Bastian would be watched, and the results noted, with the greatest interest. Then the brass wires might form a subject of further consideration on his part.—ED. G. J.]

Mr. J. B. Stewart on Distribution Problems.

SIR,—I should strongly advise Mr. Stewart [*ante*, p. 80] to fix a cock on the outlet of that laundry meter, and to place the key of the inlet-cock where it can only be got at in case of fire. The man in charge of the compressor, who was responsible for the last two accidents to the meter, and whose silence on the matter was extremely golden, will know the reason why this has been done.

For Sharp and Preston, Ltd.

A. DOCKING, Chief Engineer.

Francis Street, Dublin, Oct. 14, 1918.

PARLIAMENTARY INTELLIGENCE.

PROGRESS OF BILLS.

Since the re-assembling of Parliament last week, the following intimations have appeared with regard to Gas Bills.

In the House of Lords, petitions against the South Suburban Gas Bill have been deposited by the South-Eastern and Chatham Railway Companies' Managing Committee, and by the two Companies.

In the House of Commons, the Commercial and Portsea Island Gas Bills have been read the third time and passed. The Rhymney and Aber Valleys Gas and Water Bill has been withdrawn. Petitions against the Gas Light and Coke Company's Bill have been withdrawn by the St. Marylebone Borough Council, the West Ham Corporation, the Corporation of London, the Hackney Metropolitan Borough Council, and the Willesden Urban District Council.

LEGAL INTELLIGENCE.

CLAIM FOR PREPAYMENT METER RENT.

At the Tredegar County Court, last Tuesday, the case again came on for hearing [see "JOURNAL" for Sept. 24, p. 578) in which the Brynmawr and Blaina Gas Company sued Mr. B. C. Tucker and others for 1s. 6d. rent of prepayment meters.

Mr. ST. JOHN WILLIAMS was for the Company. The defendants were not present, neither were they represented legally.

It will be remembered that the Company in pre-war days included the rent of the meter in the price charged for the gas. When war conditions increased their expenses, they raised the price of gas, and eventually gave notice to the consumers, on Dec. 31, that, as and from Jan. 1, they intended charging the users of prepayment meters the sum of 1s. 6d. a quarter rent. A few of the consumers refused to pay, and were brought before the Justices at Blaina. There their legal representative argued that sufficient notice had not been given for the winding-up of one contract and the starting of another. There was considerable argument, after which the Magistrates decided to dismiss the summonses, which were for the recovery of the meter-rent for the quarter from January to March. The next move of the Company was at the September sitting of the Tredegar County Court, when the Company sued Mr. Tucker and the others for the rent for the quarter ended June. Only Mr. Tucker then appeared; and the defendants were not legally represented. Mr. Tucker said the local Trades and Labour Council, of which he is the Secretary, considered the point of law so important that he asked for an adjournment. His Honour Judge Hill Kelly granted the adjournment on the condition that the defence should not be gone into at the October Court, unless the defendants had previously paid the costs of the day of the Company for the September sitting. When the case came on last Tuesday,

Mr. WILLIAMS reminded his Honour of the previous hearing, and said the previous day one of the defendants paid plaintiffs' representative half-a-crown. He now asked for judgment with costs.

Mr. *D. A. Price*, Secretary of the Company, spoke to the facts, and said the four defendants were customers of the Company, and paid the quarter's rent to March for the hire of the meter.

His HONOUR gave judgment for the Company in all four cases.

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Khaki Yellow WN Paste

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Nigrosine Base
Oil Red BN
Oil Yellow Base

SPIRIT COLOURS

Basic Colours as listed above
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Oil Yellow Base

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Cross Dye Deep Brown R
Cross Dye Green B
Cross Dye Government Drab GY, WA, WB
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Cross Dye Yellows

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REGISTER OF PATENTS.

Gas-Engine Governors and Valves.—No. 105,567.

DOUGLAS, T., of Scarboro, New York State.

No. 5136; April 12, 1917. Convention date, April 12, 1916.

This invention relates to improvements in gas-engine speed-governors of the type in which a valve is operated by the governor so as to diminish or cut-off the combustible mixture for the engine when a certain maximum speed is reached.

A previous engine-speed governor (for vehicles) was of duplex design to be driven by gas-engines in general, and arranged to respond to the speed of two distinct elements, one of which is actuated by the vehicle carrying the governor and the other direct by the engine which propels the vehicle. But, according to the present invention, an arrangement is provided comprising a governor and a valve controlled by it, in which a casing carries the valve on a pivot, and an adjacent casing carries a governor at one side of the valve to actuate same—adjustable devices on the side of the valve opposite to the governor being provided to limit both ends of the range of movement of the valve.

Manufacture of Resins from Benzol Plant Residues. No. 112,419.

H. KOPPERS COMPANY, of Pittsburgh, and DARRIN, M., of Wilkinsburg, Penn., U.S.A.

No. 14,166; Oct. 1, 1917. Convention date, Dec. 30, 1916.

In obtaining benzol from bye-product coke-ovens, the patentees remark, the gases from the ovens are passed through a tower, where the benzol hydrocarbons are absorbed in a heavy petroleum oil, which is then taken off and distilled to obtain the hydrocarbons in the form of a light oil containing a large percentage of benzol. The oil is then distilled to obtain the benzol content and other constituents—such as toluol; the distillation producing residues of variable composition, which have heretofore been thrown away. There are also residues that separate from the oil flowing from the scrubber where the gases pass in contact with the petroleum oil—these also being discarded.

The present process is said to produce resins of good uniformity from a wide variety of benzol plant residues, and, by suitable variation of the treatment, resins of different melting points may be obtained—up to resins having a melting point of 115° C.

This invention consists essentially in dissolving the residues in a suitable solvent, or combination of solvents, and then distilling the solution until the temperature of the vapours passing off reaches a certain point, which depends upon the nature of the solvent and the consistency of the desired resin product. As a solvent, it is preferred to use solvent naphtha, though other hydrocarbon oils or solvents may be employed, if capable of dissolving the residues without affecting the essence of the invention. After the solution is formed, it is subjected to distillation until the temperature of the vapour passing on is between 150° and 300° C.—the lower the temperature of the vapours, the softer the grade of resin produced. Different grades of resin may thus be produced by carrying the distillation to a higher or lower vapour temperature.

Collapsible Gasholders for Motor-Driven Vehicles. No. 118,176.

UNITED AUTOMOBILE SERVICES, LTD., of Lowestoft, and JOLLY, J. C., of Bishop Auckland.

No. 13,641; Sept. 22, 1917. No. 18,762; Dec. 18, 1917.

This combined invention relates to collapsible gas bags or holders employed upon motor-driven vehicles; and it more particularly concerns the filling of the holders by means whereby the supply is automatically cut off, and charging stopped, when the bag or holder is filled to the required extent. This prevention of overcharging is ensured by a connection between the holder and a valve in the charging pipe, so that when the bag is sufficiently inflated the valve is caused to close.

Storing Coal Gas for Use in Motor Vehicles. No. 118,327.

OTTINO, G. P., of Kilburn, N.W.

No. 12,151; Aug. 24, 1917. No. 12,722; Sept. 5, 1917.

The object of the present (combined) invention is to construct a storage receptacle or gas-reservoir "of such a character as to be more acceptable in appearance" than the type usually seen, having an "increased gas-carrying capacity in proportion to the outside dimensions of the gas-bag itself."

With this object, the receptacle for containing the gas is mounted on the roof of the vehicle, the sides and ends of which are extended upwardly, in order to provide a support for the depth and form an enclosure for the sides and ends of the gas-bag. To provide means for the even inflation and deflation of the gas receptacle, pleats are formed in it so as to construct more or less concertina-like sides and ends. The pleats are preferably reinforced by metallic bars applied either to the interior or the exterior of the receptacle.

To resist the effects of the wind on the exposed surfaces, the receptacle may be made with declining surfaces towards the sides and ends, leaving the central portion more or less dome-shaped; and for the purpose of increasing the capacity of the receptacle itself, there is provided within the interior of the bag (preferably disposed about the middle) a secondary storage receptacle of balloonette type, into which is compressed a supply of gas under pressure, so that when by the use of the coal gas in the main receptacle the quantity in it is materially reduced, by manipulating a valve the contents of the interior balloonette are released into the exterior receptacle, whereby the quantity of gas in it may be replenished and the desired volume at a low pressure maintained.

By this combination of a storage receptacle with an interior provided with a secondary storage receptacle for carrying coal gas under pressure, the carrying capacity of the gas-bag will be materially increased —"thus fulfilling more effectively the purpose for which such storage receptacles are employed." If desired, by the employment of a pressure-reducing valve, the contents of the secondary storage receptacle may be released automatically into the outer or main reservoir, whence the supply is taken to the engine.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Oct. 16.]

Nos. 16,227—16,679.

BARNABY, K. C.—"Gas cooking-stove or oven." No. 16,401.
BOOTH, J.—"Boxes for packing incandescent mantles." No. 16,336.
BROXBURN OIL COMPANY.—"Process of utilizing residues from bituminous shales, cannel coals, &c." No. 16,542.
COLLISON, W. E.—"Operation of valves or cocks." No. 16,602.
CROCK, T.—"Igniting-devices for combustible gases." No. 16,426.
DAVIS, H. N.—"Gas-fired regenerative furnaces." No. 16,324.
FINDLATER, R. H.—See Broxburn. No. 16,542.
HUNT, N. H.—"Fluid-meters." No. 16,287.
JACOB & Co., W. & R.—"Gas-burners." No. 16,509.
KENT, W. G.—See Hunt. No. 16,287.
LONG, S. J. T.—"Device for cooking on gas-stoves, &c." No. 16,375.
MAYER, C.—"Manufacture of rings for mantles." No. 16,432.
NATIONAL GAS-ENGINE COMPANY.—"Valves for internal-combustion engines." No. 16,298.
NATIONAL GAS-ENGINE COMPANY.—"Apparatus for ventilating crank cases of internal-combustion engines." No. 16,299.
OGLE, P. J.—"Burners for gas heating and cooking appliances or apparatus, &c." No. 16,292.
PALMER, C. S.—"Making natural-gas substitute." No. 16,304.
PALMER, J. F.—"Gas-compressor or blower." No. 16,663.
ROBERTS, W. T. B.—"Incandescent gas-burners." No. 16,479.
SAMUELSON, F.—"Gas heating and cooking appliances." No. 16,445.
TWIGG, W. R.—See Davis. No. 16,324.
WILLIAMS, G. N.—"Gas-burners." No. 16,509.
WILSON, J.—"Incandescent mantles and supporting same on burners." No. 16,465.

Quality of Gas at Ashton-under-Lyne.—The recent increase of 6d. per 1000 c.ft. in the price of gas at Ashton was referred to at a meeting of the local Trades Council, when a resolution of protest was passed—to be sent to all the gas undertakings in the area covered by the Council.

Coal Shortage and Evening Church Services.—In making the suggestion that church services should be held in daylight, Sir Albert Stanley (the President of the Board of Trade) states that the question of the country's coal supply is a serious one; and in spite of all the measures which have been taken to meet the situation, he cannot but feel the gravest anxiety as to the supply during the coming winter.

A Petroleum Well in Derbyshire.—The Marquis of Hartington has inaugurated the first petroleum well to be drilled in this country. It is on the Duke of Devonshire's property in the mining district of Hardstoft, Derbyshire, and a few miles from Chesterfield. The enterprise follows upon an investigation made by Viscount Cowdray's geological staff during the last four years. Messrs. S. Pearson & Son, Ltd., were appointed the petroleum development managers for the mineral oil production department of the Ministry of Munitions in connection with the undertaking.

An Exhibition of Bye-Products at Reading.—An unanswerable argument in favour of the using of gas in preference to raw coal for both cooking and heating, is, says the local "Standard," the exhibition of bye-products that has been prepared by the Reading Gas Company. These comprise benzene, used in the manufacture of high explosives; toluene, from which the celebrated high explosive "T.N.T." is manufactured; solvent naphtha, used by manufacturers as a solvent for rubber, and for many other purposes; and carbolic oils and phenol (carbolic acid), from which picric acid is manufactured. Other articles shown are sulphate of ammonia, picric acid, and spent oxide of iron. The window in Friar Street containing these exhibits presents a beautiful appearance as regards colour; while their practical utility in these days is beyond question.

Presentation to a Gas-Works Foreman.—In the Recreation Room at the Buckland Gas-Works, Dover, last Friday, a presentation was made to Mr. Thomas Pybus, who has recently resigned from the position of foreman. The room was well filled with employees, and Mr. Willsher Mannering (the Chairman of the Company), who presided, was supported by Mr. E. C. Herring (the Works Manager), and Mr. W. Severs (the present foreman). Mr. Herring voiced the feelings of the assembly in the keen regret they felt that ill-health had caused the severance of so many pleasant associations, and wished Mr. Pybus many years of well-earned leisure. The Chairman then asked Mr. Pybus to accept a gift from his fellow workmen as a small token of their esteem. The gift consisted of an eight-day chiming clock, in a handsome polished mahogany case, and bore the following inscription: "Presented to Mr. T. Pybus by his fellow workmen, in recognition of his 32 years' service as foreman of the Dover Gas-Works." Mr. Pybus said the gift would be highly treasured; and his parting from so many friends caused him keen regret.

MISCELLANEOUS NEWS.

COMMITTEE ON SUPERANNUATION OF MUNICIPAL EMPLOYEES.

Mr. Hayes Fisher, M.P., the President of the Local Government Board, has appointed a Committee to consider whether it is desirable to introduce a scheme of superannuation applicable to persons in the employment of Local Authorities in England and Wales; and, if so, to make recommendations on the subject with special reference to the following points:

(*a*) The finance and general working of any such scheme.
(*b*) Classes of officials or employees which it should embrace.
(*c*) Its relation to any existing superannuation scheme.

The following are to be members of the Committee:

Mr. R. C. Norman (Chairman of the L.C.C.), Chairman, Mr. John Boggan, Sir Arthur W. Chapman, Mr. Arthur Collins, Mr. W. R. Davies, C.B., Mr. W. P. Elderton, the Rev. R. V. O. Graves, Sir Harry Haward, Mr. Charles Knight, Mr. Harry List, Mr. E. R. Pickmore, and Sir Alfred W. Watson.

Mr. G. W. B. M'Leod will be Secretary of the Committee; and all communications should be addressed to him at the Local Government Board, Whitehall, S.W.

EDINBURGH GAS-WORKERS' WAGES.

An Agreement Reached.

In our issue of the 8th inst., it was stated that a meeting of Edinburgh gas workers was to be held in order to consider certain proposals made by the Gas Commissioners. The men, through their Union (the National Union of Corporation Workers), had asked for the present bonus of 18s. 6d. per week—in operation since May 1 last—to be increased to 25s. for a six-days' week, as from the expiration of the last agreement (Aug. 31), with the addition of 12½ p.ct. on total earnings, as before. They further requested that overtime and Sunday labour be paid for at double ordinary rates. The Commissioners offered to increase the bonus to 22s. for a six-days' week, and to grant an extra 3s. 8d. to men working on Sundays; but they declined to pay more than the present rate of time-and-a-half for overtime.

These proposals were submitted to the men at a mass meeting, when a resolution was passed against the acceptance of the 22s., and asking for a further conference, with a neutral chairman. The conference took place at the Edinburgh City Chambers on the 11th inst.—Sir Thomas F. Wilson, of Glasgow, presiding; the parties being the Union, the Corporations of Edinburgh and Leith, the Gas Commissioners, and the Edinburgh and District Water Trust. After a very lengthened discussion, it was agreed that the bonus for employees, other than general workers, clerical and collecting staffs, &c., be as follows: In the electricity and water undertakings, 23s. 6d. per week, and 22s. 9d. in the gas undertaking, with, in the latter case, an addition of one-sixth of the bonus for Sunday work. The question of the bonus for general workers, clerks, &c., was then discussed. The demand was for an increase from 17s. to 25s. per week. An offer of 21s. was made; but this was declined—22s. being stated as the minimum. As the various representatives of the employing bodies could not see their way to grant this, without further consulting their parent committees, the Union officials asked that the whole matter should be left open, and that the conference be adjourned until the following Friday. This was agreed to.

The adjourned conference duly took place last Friday, and ended by the employers conceding the extra shilling asked for. The result, so far as the Gas Commissioners are concerned, was therefore as follows: (A) Male employees, over 18 years of age, other than general workers, clerks, &c., an advance from 18s. 6d. to 22s. 9d. per week, with 12½ p.ct. on total earnings; Sunday workers to receive an additional day's bonus; youths of 18 years of age and under, an advance from 9s. 3d. to 11s. 4½d. per week. (B) General employees over 18 years of age, including clerks, &c., an increase of 5s.—making the bonus 22s. per week; youths, one-half this amount. The agreement as regards category (A) to be for four months from Sept. 1 last, and as regards (B) for six months from the 1st prox.

COMMITTEE ON PRODUCTION AWARDS.

The following further award in connection with gas-workers' wages has been issued by the Committee on Production:

HASTINGS GAS COMPANY.

The claim submitted on behalf of the members of the National Union of General Workers in the employ of the Company was for the application of the National Award (No. 1068), dated March 27, relating to gas workers. Representatives of the parties were heard on Oct. 1. The men concerned have received an advance of 4s. per week in accordance with the terms of the award in question, but have not received the bonus of 12½ p.ct. on earnings. The bonus of 4s. was given by the Company during the first week in July last. The war bonus paid to the men concerned amounts, in the case of shiftmen, to 19s. per week (on a basis of six shifts), and in the case of other workers to 17s. per week of 56½ hours. The award of the Committee is as follows: (6) The able-bodied men concerned, aged 21 years and over, who are paid as plain timeworkers, shall receive a bonus of 12½ p.ct. on their earnings, which shall not alter or become part of their time rates. (7) Clause 6 of this award shall not apply to any workmen in receipt

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of any allowance or bonus other than: (*a*) An allowance or a bonus wholly dependent on time-keeping; (*b*) an allowance or a bonus (not being a bonus on output) less favourable to the men than the advance of 12½ p.ct. hereby awarded, in which case the existing allowance or bonus shall merge in the 12½ p.ct.; (*c*) war advances given to assist in meeting the increased cost of living since the outbreak of the present war. (8) The men concerned, aged 21 years and over, who are piece-workers or are paid on a premium-bonus system or any mixed system of time and piece, or any system of payment by results, including men working at augmented time rates fixed in lieu of piece rates, or by reference to results or to output of work, shall receive a bonus of 7½ p.ct. on their earnings. (9) Any bonuses or war advances which, in the case of timeworkers, have merged in the bonus of 12½ p.ct. granted to timeworkers shall, in the case of pieceworkers, merge in the 7½ p.ct. bonus awarded. (10) If any payment has been made to the workmen concerned pending the general consideration of their position in relation to the bonus of 12½ p.ct. or 7½ p.ct., whether by agreement or as a result of arbitration, the amount of such payment shall merge in the bonus awarded under Clauses 6 and 8 of this award, and such bonus shall be in lieu of, and in substitution for, any such other payment. The award does not apply to workmen paid a wage or salary not dependent on time worked, or an upstanding wage or salary which covers overtime or other allowances. The boy concerned shall receive an advance of 2s. per full ordinary week, which amount is to be awarded as a war advance recognized as due to, and dependent upon, the existence of the abnormal conditions now prevailing in consequence of the war. The award is to take effect as from the beginning of the first full pay following Oct. 1.

VALUE OF COKE AS FUEL.

In the "Daily Telegraph" of the 15th inst., there was an advertisement of the Board of Trade Coal Mines Department advocating the use of coke in domestic fireplaces. This attracted the attention of Mr. Douglas H. Helps, of Reading, who wrote to our morning contemporary as follows:

The advertisement states that a test carried out by the department proves that a mixture of 12 lbs. of coke and 3 lbs. of coal maintained the temperature of a room for over six hours at a higher temperature than when the same room was heated by the consumption of 17 lbs. of coal.

Now, under the Fuel Order, anyone may convert the whole or any portion of his coal ration into gas at the equivalent of 15,000 c.ft. of gas for each ton of coal.

Surely, it is desirable in the National interest that the gas equivalent should be increased to (say) 20,000 c.ft., and for the following reasons: A ton of coal produces from 12,000 to 14,000 c.ft. of gas, and in addition products which are urgently needed for munitions and as fertilizers. It also provides 10 cwt. of coke, which the Coal Mines Department have proved in the experiment referred to above to be of much greater value than the same weight of coal.

The Fuel Order points out "that there is a distinct national gain in consuming gas and coke in the place of coal." I am in a position to know that many gas undertakings are now experiencing a very large decrease in the consumption of gas, and it is, therefore, most desirable that the gas equivalent for a ton of coal should be increased, as suggested, in order to encourage the use of gas in the place of coal.

FUEL ECONOMY IN THE HOME.

Different Methods of Heating.

Mr. A. H. Barker, B.Sc., B.A., Wh.Sc., Lecturer in Heating and Ventilating Engineering, last Wednesday evening delivered, at University College, Gower Street, W.C., the second of his series of three public lectures [*ante*, p. 137] on the "Principles of Fuel Economy in the Home."

On this occasion, he discussed the general use of fuel in the home, and more particularly the question of heating a room, both in its qualitative and quantitative aspects. The difference between radiant and convected heat was explained; and this was followed by a comparison (illustrated by lantern slides) of practical methods of room warming. The purest practical methods of heating by radiation, the lecturer said, are by coal-fires and gas-fires respectively. These two means, however, do not heat exclusively by radiation, since some of the heat produced by the combustion of the fuel must of necessity find its way into the surrounding structures. It is probable that about 5 p.ct. of the total heat of the fuel comes into the room with an ordinary fireplace as convected heat. In some forms of gas-fire, probably about 15 p.ct. of the heat in the gas usually comes into the room as convected heat. In round figures, 50 p.ct. of the total heat in the fuel is radiated in a good modern gas-fire; the remainder being discharged into the chimney. The following may be taken as representative figures for a coal-fire: Of the total heat in the fuel, 25 p.ct. comes into the room as radiated heat, 55 p.ct. goes into the chimney (either directly or in the form of warm air taken from the room itself), perhaps 5 p.ct. is direct convected heat, and the remaining 15 p.ct. serves to warm the brickwork round the fire.

As to the important question of cost, Mr. Barker remarked that this cannot be considered irrespective of all other considerations. It may well be, for instance, that in an expensively decorated room the total cost of a coal-fire is higher than that of a gas-fire, on account of the additional labour which it involves, and on account also of the additional dirt, dust, and destruction of fittings, and the like. It is obviously impossible to formulate any general rule in this sense, apart

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from the cost of fuel. It is, however, fairly safe to say that for continuous heating, and considering only the outlay for fuel, the cost of a gas-fire is, perhaps, three times as great as that of a coal-fire, at present prices. For the purpose of establishing this calculation by an example, he conducted a special laboratory experiment. A gas-fire was lighted, and kept on a whole day, and the effect noted. On the following day, the gas-fire was removed, and a coal-fire was kept going all day, with the object of producing a similar effect in the laboratory to that produced by a gas-fire. It was, he explained, impossible to produce an identical effect, because a coal-fire is in its very nature inconstant, whereas a gas-fire is by its very nature constant in intensity. However, the experiment, though not so complete as might be wished, did conform to the figure he had named. A diagram showing the total amount of heat in the fuel consumed during the time in question, indicated that a gas-fire is just about twice as efficient in the scientific sense as is a coal-fire; and this figure is confirmed from other sources. The outstanding advantage of the gas-fire is the rapidity with which it can be brought into full action. Under the conditions of the experiment referred to, the gas-fire attained practically its maximum intensity within 15 minutes; while the coal-fire only reached the intensity of the gas-fire after a period of about an hour.

For the continuous heating of a room, the coal-fire has a very great advantage over the gas-fire in its superior economy; while for occasionally-used rooms, and rooms which it is necessary to prepare for occupation within a short time, a gas-fire can hardly be dispensed with, because a coal-fire attains its maximum heat so slowly, and each time it is lighted it involves somebody in a great deal of tiresome and dirty work. The electric fire has every conceivable advantage on its side except that of expense. This, however, is so enormous that electric fires can be ruled-out as serious competitors of any kind of heating for all except very wealthy persons. If naked gas-flames are to be used for warming a room, there is only one correct way of doing it. This is by one of the reflector stoves, which convert a considerable portion of the total heat of the gas into radiation; the remainder being allowed to pass into the room as convected heat. The one justification for the use of a naked gas-flame to heat a room is that it has a real efficiency of 100 p.ct. (reckoned on the heat in the gas, and not in the coal from which it is produced), and that by no other means can the air of a room be so rapidly raised in temperature.

The proportion between the amount of energy that must be introduced into a room as convected heat and as pure radiant heat, in order to produce the same effect, varies very much according to the surroundings. If the radiant heat is prevented from reaching the outside surfaces of the wall, the amount of heat required is just about the same in both cases; but if no such precautions are taken, it is probable that a room will be rendered equally warm by 100 units of heat conveyed as radiant heat, as by 60 units introduced as convected heat. But the lecturer said he gave this figure with considerable reservation, as it was obtained solely under the conditions of his laboratory.

While in heating a room by electricity there is apparently 100 p.ct. efficiency, in reality the efficiency is only 8 p.ct., calculated on the heat in the coal. Almost any other method, declared Mr. Barker, is better than this. Indeed, all electrical developments are terribly handicapped by the frightful inefficiency of the process of power generation.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Oct.* 21.

Pitch continues the chief item of interest in the London tar products market. There is a considerable amount of inquiry, and the market is firm at not below 65s. per ton net in bulk f.o.b. makers' works. Creosote and other tar oils continue in good demand at the Government fixed prices. Solvent naphtha is steady at about 3s. 9d. per gallon net.

In sulphate of ammonia, the position remains unchanged; orders being readily forthcoming for all available quantities.

Tar Products in the Provinces.

Oct. 21.

The average values for gas-works products during the week were: Gas-works coal tar, 30s. 6d. to 35s. 6d. Pitch, East Coast, 44s. to 45s. per ton; West Coast—Manchester 36s. to 37s. 6d., Liverpool 36s. to 37s. 6d., Clyde 36s. to 37s. 6d. nominal. Benzol 90 p.ct., North, 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha in bulk, North, 7¾d. to 8¼d. Solvent Naphtha, naked, North, 2s. 11d. to 3s. Heavy naphtha, North, 2s. 11d. to 3s. Creosote, in bulk, North, 4¼d. Heavy oils, in bulk, North, 5d. Carbolic acid, 60 p.ct. East and West Coasts, 3s. 3d. naked, nominal. Naphthalene, £25 to £30; salts, £6 to £7, bags included. Anthracene, "A" quality, 4d. to 6d. per unit; "B" quality, 1½d. to 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

There is very little change in tar products; market conditions remaining quiet. Pitch, however, keeps in strong demand, and makers are very confident regarding the future; the feeling being—especially in Provincial centres—that the upward tendency is likely to continue. The Government having decided to pay 40s. per ton *ex* works for all pitch that they take for their compound fuel oils seems to have fixed the price for other buyers; and the general opinion now is that prices are hardly likely to fall below this figure, but that it may easily go higher. London quotations are steady at around 65s.; but trade in the Provinces is largely a matter of negotiation. The export demand

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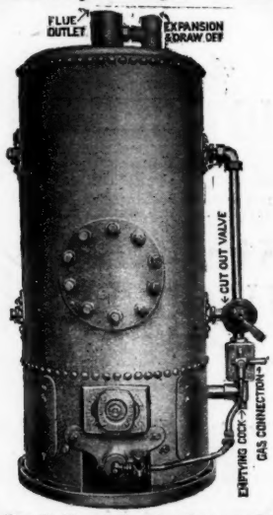

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remains as strong as ever; but, unfortunately, the shortage of shipping continues to prevent development in this branch of the trade. These conditions must of necessity continue for some time; for even should peace be declared in the early future, some time must elapse before shipping becomes more plentiful, in view of the Government requirements for the transportation back home of our armies. South Wales buyers for the briquette trade are adopting a hand-to-mouth attitude, evidently not liking the prices they are now called upon to pay. Fuel oils continue in urgent request. In comparison with other fuel oils, control prices are said to be low, and some effort is likely to be made to secure better terms. Solvent naphtha has developed quite a strong tone, and Provincial makers are asking up to 3s. 6d. per gallon naked. London prices are about 3d. per gallon more. Heavy naphtha is steady at 3s. 6d. per gallon. Refined naphthalene experiences very little demand; but prices show no falling off, although conditions are rather more uncertain. Crude naphthalene, however, is very strong on continued demand by the makers of firelighters; and the tendency of prices is upward. Commonest sorts are making quite £7 per ton, and better qualities up to £16. Benzol, toluol, and creosote remain without change. Anthracene, refined sorts, continues at 6d. per unit per cwt.; while aniline oil is a little stronger at 1s. 4d. per lb. Carbolic acid is rather uncertain; no definite news having been received as to the progress in negotiations between sellers of crude 60's and makers of crystals. The former will not be satisfied unless they receive from 3s. to 3s. 6d. per gallon for 60's so long as makers of crystal can obtain from 1s. 8d. to 2s. per lb. for their product, with good demand at even the latter figure. The range of quotations is as follows:

Benzol: 90% London, 1s. 0½d., North 10½d. to 11½d.; 50% North 1s. 4d. to 1s. 5d. naked per gallon.

Carbolic Acid: 60% East and West Coast 3s. per gallon; crystals 40% 1s. 8d. to 2s. per lb.

Crude Tar: London 39s. to 41s.; Midlands 33s. to 35s.; North 32s. to 34s. per ton *ex* works.

Pitch: London 65s. per ton f.o.b. works; East Coast, 36s. 6d. to 37s. 6d.; West Coast, 37s. 6d. to 40s. f.a.s.; Manchester, 39s.; Clyde, 41s.; South Wales, 45s. per ton.

Solvent Naphtha: London 3s. 3d. to 4s.; North and Midlands 3s. to 3s. 6d. per gallon.

Crude Naphtha: Naked 30% 8¼d. to 8½d.; North 6½d. to 6¾d.

Naphthalene: Refined £28 per ton nominal; salts 80s., bags included.

Toluol: Naked, London 2s. 4d.; North 2s. 3d.

Creosote: Nominal, London 4¼d.; North 4d. to 4⅛d. (Government price, 75s. per ton f.o.b.—equal to 4⅛d. per gallon); heavy oil, 4½d. per gallon in bulk.

Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1⅞d. to 2¼d.

Cresylic Acid: 95%, 3s. per gallon; 97-99%, 3s. 3d. to 3s. 6d. per gallon, casks included, *ex* works London and f.o.b. other ports.

Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

Exports continue on a rather larger scale than earlier in the year. The home position is unchanged; the demand being as insistent as ever. It would seem that merchants are taking up a large portion of the make in anticipation of what will probably constitute a record demand from the farmers. Synthetic production is very little heard of.

Carbonizing Economies at Oldham and Blackpool.—As already noted in the "JOURNAL," the consumption of gas at Blackpool has had an upward tendency during the summer months, doubtless due to the heavy day-load caused by gas-cookers in the hotels, apartment houses, &c.; but at the last meeting of the Gas Committee it was reported that for the four weeks ended Oct. 10 there was a slight decrease in the consumption, as compared with last year's figures—these being respectively 58,270,000 c.ft. and 60,823,000 c.ft. The coal consumed was 4387 tons, as compared with 5171 tons; the decrease of 884 tons being largely due to economies exercised by Mr. W. Chew (the Gas Engineer and Manager) in carbonization. At the last meeting of the Oldham Gas Committee, Mr. Tim Duxbury (the Engineer) reported that the stock of coal was 9000 tons, as compared with 21,000 tons last year. During the last fortnight 900 tons less had been carbonized than during the corresponding period of 1917. If they could keep up this rate of saving, Mr. Duxbury added, they would "creep through." During the fortnight ended Oct. 14, the gas delivered amounted to 56,380,000 c.ft.; whereas in the corresponding period of 1917 it was 60,434,000 c.ft.

Quality of Coatbridge Gas.—The quality of the gas being supplied by the Coatbridge Gas Company was again the subject of discussion at the last meeting of the Town Council. Bailie Lindsay (the Convener of the Fire and Lighting Committee) said that from between May of last year and this month the Committee had taken sixteen tests of the gas, with the result that there was found an average of 17·2 p.ct. of atmospheric air being introduced into the illuminant. He held that the time had come when the public should be informed of the kind of gas they had been receiving. He did not think it was necessary that the Company should allow such a large percentage of air into the gas. The consumer was really paying for air, as well as gas. He remarked that it was curious that the proportion was always either 17 or 19 p.ct. of air. The Town Council should do something to protest against it. He did not object to the Company extracting certain things from the gas in compliance with the Government requirements at the present time; but this air supply was taking something out of the pockets of the consumers. Judge Agnew said that one-fifth ought to be deducted from every gas account for the air in the gas. It was unanimously agreed to ask the Committee to take such drastic steps as would bring about some finality in the matter.

SAWER & PURVES,

THE POSITIVE DRY PREPAYMENT METER

MANCHESTER & NOTTINGHAM.

East Pembrokeshire Gas Light and Coke Company, Ltd.

A creditors' petition presented by Messrs. Evans and Rogers for the compulsory winding-up of this Company came before Mr. Justice Astbury on Tuesday last. Mr. Percy Wheeler said petitioners' debt was about £180 in respect of goods supplied; and although certain negotiations had taken place with a view to reconstruction, nothing had resulted. As the debt was not disputed, he asked for the usual order. Mr. Henriques, for the Company, asked that the petition should stand over so that the negotiations might fructify. If the order for winding-up was made, the creditors would get nothing, as the debentures covered everything; but if the negotiations resulted in reconstruction, there would be sufficient for everyone. Mr. Wheeler opposed any adjournment, as the petition had been on the file since August, and nothing had been done. His Lordship asked if anything could be obtained by allowing the petition to stand over. Mr. Wheeler replied in the negative. They had heard so often about these negotiations that he said he must press for the order. His Lordship made the usual order for compulsory winding-up.

Southwark Guardians and the Price of Gas.

The Southwark Board of Guardians, who recently protested against the South Metropolitan Gas Company again increasing the price of gas from 4s. to 4s. 4d. per 1000 c.ft., have received a letter from Mr. F. M'Leod, the Secretary, in which he states that the protest of the Guardians was apparently made under an entire misapprehension of the facts, and seemed to suggest that the increase had been unnecessarily imposed from a desire to inflict hardship upon the public and to secure larger profits. This was the reverse of the true position, as would be seen from the following. After taking into account all proceeds from the sale of bye-products, the net cost of coal per ton into the Company's works was now three times that of 1914; the price of all other materials used in the business had enormously increased; and labour charges were nearly 70 p.ct. higher. These matters were quite beyond the control of the Directors, who, in the circumstances, though with sincere regret, had no alternative but to raise their charges sufficiently to make ends meet. As stated in their leaflet, dividends had dropped from £5 9s. 4d. to £3 4s. p.ct. per annum—a reduction of over 40 p.ct. It was, therefore, quite clear that no charge of profiteering could be justly made against the Company or their shareholders, whose diminished dividends were still further reduced by payment of the increased income-tax. Certain Guardians had apparently recently displayed a remarkable lack of knowledge on this subject. It might be that the above-mentioned facts would correct the wrong impressions previously formed. The Guardians decided to take no further action, as the Board of Trade merely acknowledged the protest.

Dewsbury Gas Accounts.—The abstract of municipal accounts at Dewsbury, for the year ended March 31 last, shows that, on the whole, the undertakings are in a fairly satisfactory condition. The sales of gas yielded £33,400, and sales of residuals nearly £17,000. The gross profit was £10,850, practically all of which went in sinking fund and interest. The year's working resulted in an adverse balance being reduced from £1990 to £1470.

Public Lighting Charges at Poplar.—Notification has been received by the Poplar Borough Council from the Commercial Gas Company of further advances, as from the end of this year, in the charges for public lighting to £4 2s. 8d. per lamp per annum in the case of No. 3 Kern burners, and £4 11s. 8d. for No. 4 Kern burners. The total increase on pre-war rates will then be 68¾ p.ct. and 58 p.ct. respectively for the two sizes of burners.

Threatened Strike at Spalding.—The firm attitude adopted by the Spalding Urban Council has averted a strike threatened by employees at the gas-works. The men had handed in notices to cease work last Thursday; the ostensible reason being an error which was alleged to have been made in the particulars forwarded to the Arbitrator who is to decide shortly the question of wages. The Manager had assured the Council of his ability to carry on operations in the event of the men persisting in their determination; and it was decided, therefore, to accept the notices. The men subsequently asked to withdraw their notices; and work has since been proceeding as usual.

Bottled Fruits and Dried Vegetables.—At the Southampton Royal Horticultural Society's Autumn Show last week, the Southampton Gas Company were awarded the Society's silver-gilt and silver medals for an exhibit of bottled fruits and dried vegetables. The collection was tastefully staged by Miss Baverstock, the Company's expert; and she is to be congratulated on her initial success. Throughout the whole of the two days' exhibition, she was busily engaged in advising visitors. This is a "move with the times" for the gas industry, which it is hoped will be repeated by other gas undertakings throughout the country, whenever the opportunity arises. It will be found most helpful, not only by getting into closer touch with consumers, and so stimulating gas business, but also from the national standpoint by assisting in the saving and preserving of food.

Tar Distillation Plants and Pollution.—Dr. Barwise, the Medical Officer of Health for Derbyshire, in his report for 1917, refers to the pollution caused by coke-ovens and coal-tar distillation plants. He says that, owing to the war, the number of coke-ovens and tar-distillation plants for the making of benzol, sulphate of ammonia, and explosives has increased, and is still increasing. There are no wastes more difficult to treat than those from tar-distillation works and sulphate of ammonia plants. The result is that the rivers are now worse than they were before the war. If, as is extremely probable, after the war the system of distilling coal at the pit-mouth becomes more common, it may be advisable to construct a large joint sewer for the Rother Valley, taking the waste from the various tar-distilling plants and the sewage from the mining villages and towns down to low-lying land nearer the sea. Without some such scheme as this, the proper development of the agriculture of this area will be a matter of the greatest difficulty.

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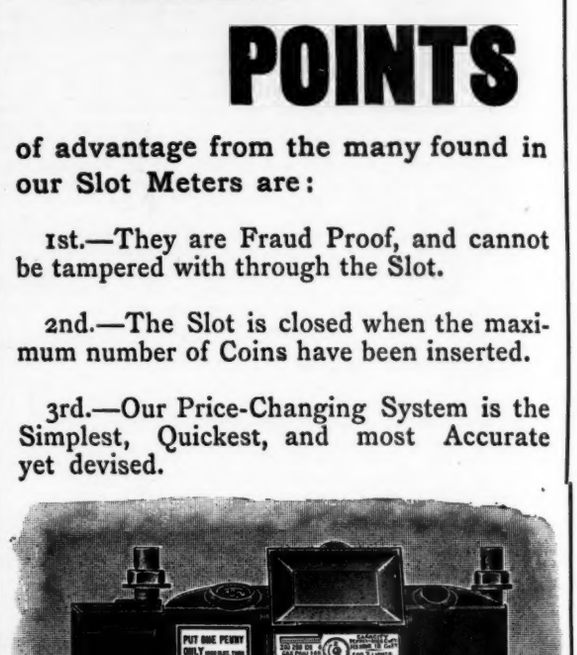

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Wages in Dublin.—The Directors of the Alliance and Dublin Consumers' Gas Company have met the application of the clerks in their employment by granting increases in salary ranging from 20s. to 25s. per week on pre-war rates.

Maximum Price at Hebden Bridge.—At the meeting of the Hebden Bridge and Mytholmroyd Gas Board last Thursday, it was reported that the Board had considered the price of gas to consumers. Under section 39 of the Act, the maximum price is 4s. 6d. per 1000 c.ft.; and the price charged to consumers is 4s. 3d. The question had arisen as to whether application should be made to the Local Government Board under the Statutory Undertakings (Temporary Increase of Charges) Act, to amend the Local Act, so as to increase the price to 6s. 9d. per 1000 c.ft., if required. The Board agreed to make the necessary application. The Manager (Mr. T. H. Nield) reported that, from Oct. 9, they had been steaming the charges in the verticals; the result being that blue water gas was made and mixed with the coal gas during manufacture, as required by the Government. Having regard to the award recently made at a conference between the National Gas Council and the National Federation of General Workers, it was resolved that the wages of stokers and others be further advanced by 7d. per day or per shift, *plus* 12½ p.ct., from the first pay day in October.

Irish Gas Prices.—At a meeting of the Warrenpoint Urban District Council, a letter was read from the local branch of the Irish National Foresters, complaining of the increase of the price of gas to 10s. per 1000 c.ft.—being, they declared, the highest price for gas in Ireland. A member of the Council said the increase was "monstrous;" and, after discussion, it was decided to communicate to the Gas Company the Council's opinion that there was no justification for the maintenance of such a figure. The Lurgan Urban Council have increased the price of gas to 5s. 3d. per 1000 c.ft.

Gas-Workers' Wages in Scotland.—Mr. Alex. Yuill, the Gas Engineer and Manager, at a meeting of the Dundee Gas Committee, reported that the matter of an increase demanded by the General Labourers' and Gas-Workers' Union had been taken up by the Scottish Gas Council. They had met; and it was remitted to a Committee of three to confer with the Union to come to terms. Ultimately it was agreed to give 3s. 6d. per week, or 7d. per shift, to men and women over eighteen, whether time or piece workers, and 1s. 9d. per week, or 3½d. per hour, to girls and youths, as from Oct. 1. It was agreed to sanction these increases; and, in reply to a question, it was stated that the gas-workers are now paid 28s. 9d. over pre-war rates, with 12½ p.ct. added.

STOCK MARKET REPORT.

WITH a catalogue of military successes in the past week which outstrips all previous records of this prolonged struggle, it almost goes without saying that the Stock Exchange shared in the general elation which animated all circles. Thus there was a complete *volte face* from the tepid torpor of the week before. Despite the reigning cheerfulness, however, business in the aggregate continued to be on a moderate scale, diversified only in some of the more speculative lines.

The gilt-edged market at first was not at its best. The 5 p.ct. Loan was fairly steady; but Consols gave way until Thursday, when they began to recover in part; and they closed on Friday at about 60¼. Home Rails were quite firm throughout the week.

The Foreign Market was in excellent case; the French loans being the brightest spot, and Russians in good demand. Chinese and Mexican issues were firm. The Miscellaneous Market provided a good deal of speculation prompted by peace possibilities.

Business in the Gas Market was active, equal in the aggregate to the level of the previous week, but less equally distributed; Gas Light ordinary, Imperial Continental, and South Metropolitan monopolizing three-fourths of it. The tone was very strong; every issue that was dealt in being done at prices materially higher than those of the week before, and quotations advancing *pari passu*. Gas Light and Coke were in great demand, and the ordinary rose 6. South Metropolitan was less active, but had an equal rise. Both Commercials were up; and, among Suburbans, both Brentfords, South Suburban, both Tottenhams, and Epsom advanced. Imperial Continental was in renewed demand, and rose from 122 to 131½ at the close.

Bargains done for cash during the week were as follows: On Monday, Brentford "B" 68½, Gas Light ordinary 69, 70, 70½, 71, 71⅞, 72, 73, ditto maximum 54¾, 55¼, ditto debenture 55½, 56, Imperial Continental 122, 122½, 123, 123½, 124, Primitiva 41s. 9d., 43s., San Paulo preference 71⅝, South Metropolitan 71½, 72, 72½, Tottenham "A" 90, 90½, Wandsworth Epsom 74⅛, 75, 75⅛. On Tuesday, Brentford "A" 76½, Buenos Aires 52, 52½, Gas Light ordinary 72, 72½, 72⅝, 73¼, 73½, 74½, 75, ditto maximum 55¼, ditto debenture 55½, Imperial Continental 123, 124, 125, 125½, 126, Primitiva 43s., 43s. 9d., South Metropolitan 72½, 73. On Wednesday, Brentford preference 79½, Gas Light ordinary 74, 74¼, 74½, 75, 75⅛, 76, ditto preference 68½, 69, Imperial Continental 125¼, 125½, 126, 126½, 127, 127½, 128, 129, Primitiva 43s., 44s. 6d., ditto preference 60s. 6d., South Metropolitan 74, 74½, 75, 76. On Thursday, Brentford "A" 78, ditto "B" 69½, 70, British debenture 67, Cape Town preference 8 1/16, Gas Light ordinary 74½, 74¼, 74½, 74¾, 75, 75¼, 75⅜, 75⅝, 75⅞, 76, ditto maximum 56, Imperial Continental 126½, 127, 127½, 127⅝, 128, 129, 130, Primitiva preference 65s., South Metropolitan 75, 75⅝, 76. On Friday, Brentford "A" 78, ditto "B" 70, 71, ditto preference 81, Commercial 4 p.ct. 61, Gas Light ordinary 74½, 74¾, 75, 75⅛, 75⅛, 75¼, 75⅜, 76, ditto maximum 55¼, Imperial Continental 127, 129, 129½, 130, 130½, 131, 131½, Primitiva preference 65s., 66s. 3d., South Metropolitan 75, 75⅜, 76, 76½.

In the Money Market, there was a good demand at first, easing later. The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When last Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
182,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	55—60	..
1,551,868	"	April 8	2½	4⅜	Alliance & Dublin Ord.	59—64	61—66	..
274,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76—79	62—67	..
280,000	" 5	April 22	7½	5%	Bombay, Ltd.	5⅜—6⅜	4⅜—5⅜*	..
50,000	10	Feb. 26	16	11%	Bourne- { 10 p.c.	25—30	20—25	..
868,110	10	"	7	7%	mouth Gas { Pref. 7 p.c.	15—15½	10—11	..
115,000	10	"	6	6%	and Water { 4 p.c. Deb.	18¾—14	9—9½	..
159,740	—	—	—	4%		..	66—68	..
992,045	Stk.	Feb. 26	14	14%	Brentford A Consolid.	261—266	77—80	76⅞—78
734,220	"	"	11	11%	Do. B New	204—209	68—71	68¼—71
55,000	"	"	5	5%	Do. 5 p.c. Pref.	105—111	77—82	79½—81
221,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91—98	82—84	..
217,880	"	Feb. 26	11	8½%	Brighton & Hove Orig.	208—212	135—140	..
344,260	"	"	8	5½%	Do. A Ord. Stk.	154—159	98—98	..
630,000	20	Mar. 26	12½	22½	British	44—45	30½—31½	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	64—66	67
245,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	85—87	51—54	52½—52½
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	3½—4½	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	7½—8½	8 1/16
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	75—81	..
1,518,980	"	Feb. 12	5/9/4	36/-	Commercial 4 p.c. Stk.	106—108	60—65	61
550,000	"	"	5½	30/-	Do. 5 p.c. do.	109—105	57—63	..
475,000	"	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	53—54	..
800,000	"	"	4	—	Continental Union Ltd.	76—79	48—53	..
900,000	"	"	7	—	Do. 7 p.c. Pref.	115—118	68—73	..
278,400	—	—	—	10½%	Croydon B and C 7 p.c.	..	140—150	..
—	—	—	—	10%	Do. E	..	..	..
492,370	Stk.	—	6	6½%	Derby Con. Stk.	128—125	96—100	..
55,000	"	—	4	4%	Do. Deb. Stk.	109—104	86—88	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17½—18	12—13	..
16,298,975	Stk.	Feb. 10	4/17/4	29/4	Gas { 4 p.c. Ord.	98—102	74—76	69—76
2,800,000	"	"	3½	3½%	Light { 3½ p.c. max.	76—79	54—56	54⅜—56
4,069,285	"	"	4	4%	and { 4 p.c. Con. Pref.	96—99	67—69	68½—69
4,674,850	"	June 11	3	3%	Coke { 3 p.c. Con. Deb.	72½—74½	54—56	55½—56
130,000	"	"	10	10%	10 p.c. Bonds	..	..	..
258,740	"	Mar. 12	5	2½%	Hastings & St. L. 5½ p.c.	87—89	46—50	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	15½—16½	7—8	..
85,600	—	—	—	24%	Hornsey 7 p.c.	..	112—117	..
181,000	Stk.	Mar. 12	7½	6½%	Ilford A and C.	151—154	90—95	..
65,780	"	"	6¾	4⅞%	Do. B	115—118	69—74	..
65,500	"	June 26	4	4%	Do. 4 p.c. Deb.	92—94	62—65	..
4,940,000	"	May 14	9	4½%	Imperial Continental	150—150	126—131	129—131½
1,325,000	"	Feb. 12	8½	5½%	Do. 5½ p.c. Deb. Red.	84—86	71—73	..
235,342	"	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	93—98	..
2,498,906	"	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A	211—218	82—84	..
					{ B	146—148		
806,088	"	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	71—73	..
75,000	5	June 11	6	3%	Malta & Mediterranean	4¼—4⅝	3½—3⅝	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	87—98	..
541,930	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	8¾—9½	..
1,875,823	Stk.	July 29	4½	8½%	Newcastle&Gatsh'd Con.	98½—99½	67—69	..
529,705	"	June 26	8½	8½%	Do. 8½ p.c. Deb.	82—83	59—61	..
55,940	10	Feb. 26	7/14/0	7½	North Middlesex 7 p.c.	14—15	9½—10½	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	102—104	..
80,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	4—5	..
60,000	50	Feb. 26	18	9%	Portsea, Island B	125—131	78—83	..
100,000	50	"	12	6%	Do. C	118—121	73—78	..
53,000	50	"	10	6%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5⅛—6	2½—3	41/9—44/6
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4⅝—5	3—3½	60/6—66/3
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—98	75—77	..
—	—	—	—	4%	Do. 1911	..	50—55	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	86—87	55—60	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	7½—7⅞	7 1/16
195,000	50	July 1	5	5%	{ 5 p.c. Deb.	47—49	40—42	..
185,000	Stk.	Mar. 12	10	10%	Sheffield A	228—234	..	..
209,984	"	"	10	10%	Do. B	229—234	168—172	..
523,500	"	"	10	10%	Do. C	220—222	..	..
90,000	10	May 28	9	6/-	South African	10½—11½	11½—12½*	..
6,609,895	Stk.	Feb. 10	5/4/0	82/-	South Met. 4 p.c. Ord.	111—118	78—77	71½—75½
250,000	"	July 12	—	5%	Do. Pref.	..	91—98	..
1,895,445	"	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	54—56	..
234,890	"	Feb. 26	8½	6%	South Shields Con. Stk.	157—159	118—119	..
962,795	"	"	6	8½%	S'th Suburb'n Ord. 5 p.c.	114—116	71—74	..
60,000	"	"	5	5%	Do. 5 p.c. Pref.	110—112	73—75	..
135,000	—	—	—	8½%	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	88—85	..
647,740	"	May 14	5	3%	Southampton Ord.	99—102	68—71	..
190,000	"	Feb. 12	7½	5½%	Tottenham { A 5 p.c.	135—138	92—97	90—90½
782,275	"	"	6	4%	District { B 3½ p.c.	115—117	67—69	..
181,955	"	June 26	4	4%	{ 4 p.c. Deb.	87—89	61—63	..
189,880	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
286,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½—109½	87—88	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	"	Feb. 26	8½	63/9	Wandsworth A 5 p.c.	151—156	90—95	..
255,686	"	"	6½	48/9	Do. B 3½ p.c.	129—134	70—75	..
108,075	"	"	5/17/8	44/7½	Do. C 3½ p.c.	110—115	70—75	..
353,000	"	"	6½	42/6	Wimbledon 5 p.c.	117—122	70—75	..
98,000	"	"	6½	48/9	Epsom 5 p.c.	121—126	72—77	74½—75½
88,416	"	June 26	8	8%	3 p.c. Deb. Stk.	66—69	49—52	..

* Ex Div.

Damages for Personal Injuries against the Gas Light and Coke Company.

The action of *Cooper v. Gas Light and Coke Company*, which was tried before Mr. Justice Coleridge on Thursday last, was brought to recover damages for personal injury caused through the alleged negligence of defendants' servants. Defendants denied negligence; and said the accident was due to the careless driving of the driver of the bus on which plaintiff was serving. Plaintiff was a conductor in the employment of the London General Omnibus Company. On Jan. 13, while conducting a motor bus proceeding along the Commercial Road, towards Sutton Street, which was a compulsory stopping place, the bus overtook a horse and van belonging to defendant. After passing, it stopped at the kerb, when the shaft of the van struck the bus and the conductor, injuring his hip and thigh. Evidence was given in support of plaintiff's case. For the defendants, the driver of the van was called, and stated that the accident was caused entirely by the bus suddenly stopping in front of him, and not leaving him sufficient room to pull up, especially considering the greasy state of the road. In the result, his Lordship entered judgment for plaintiff for £37, with costs.

The Directors of the Finedon Gas Company are retaining the services of their Manager, Mr. W. H. Harris, and have advanced his salary £50 per annum.

The "Vossische Zeitung" says that the epidemic of Spanish influenza at Potsdam has increased to such an extent that the gas-works are unable to maintain the necessary production.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Assistant Engineer and Manager. Macclesfield Gas Department. Applications by Oct. 28.
Assistant Manager. Leeds Gas Department. Applications by Oct. 28.
Engineer and Works Manager. Cork Gas Company.
Draughtsman. No. 6517.
Draughtsman. No. 6515.
Assistant Chemist. Barnet Gas and Water Company.

Appointments, &c., Vacant (*Continued*).

General Foreman. Warrington Gas Department.
Working Manager and Fitter. No. 6513.
Carbonizing Foreman. Chesterfield Gas-Works.
Carbonizing Foreman. Barnet Gas and Water Company.
Stokers. No. 2919. Care of Frost, Smith, & Co.

Appointments, &c., Wanted.

Manager or Assistant Manager. No. 6509.

Plant, &c., for Sale.

Iron Sheets. Erector, Leeds.
"Law Relating to Gas and Water." No. 6516.

Plant, &c., Wanted.

Typewriter. Northampton Plating Company.

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

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(See p. 210.)

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